IMPERIAL
DEPARTMENT OF AGRICULTURE
FOR THE WEST INDIES.

IMPERIAL BUREAU OF MYCOLOGY
24 NOV 1924

REPORT

ON THE

AGRICULTURAL DEPARTMENT, ST. VINCENT,

FOR THE YEAR

1923.

TRINIDAD.
ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE
FOR THE WEST INDIES.

1924.

[Price Sixpence.]

REPORTS

ON THE

BOTANIC STATION, ECONOMIC PLOTS, AND AGRICULTURAL EDUCATION, ST. VINCENT.

Annual Reports on certain Economic Experiments conducted in connexion with the Botanic Station, 1900–2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments, and Agricultural Education for the years 1902–3 to 1918–23.

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1924.

LETTER OF TRANSMITTAL.

Commissioner of Agriculture—to His Honour the Administrator, St. Vincent.

No. V. 1304.

TRINIDAD, 27th June, 1924.

SIR,

I have the honour to transmit herewith the Report on the Department f Agriculture, St. Vincent, for the year 1923.

2. The report is of an exceedingly complete and valuable nature and its ontents deserve careful study and attention.

3. Experiments with varieties of economic plants technically well-conducted re a useful feature, and the experiments with varieties of sugar-cane may be eferred to as being of especial interest and value at the present time.

4. In regard to crop pests, the report shows the success that can be obtained y and the essential necessity of community action.

5. The report includes information regarding Mr. Burd's researches on cotton. hese will be studied widely by all interested in West Indian cotton.

6. Two striking features in regard to cotton production have been the relative crease of peasant cotton areas compared with estate cotton areas during the last vo years, and, secondly, the great improvement in yield per acre.

7. The report refers to Land Settlement and Agricultural Credit Societies, and the whole indicates that a large amount of active and valuable work has been complished by the St. Vincent Agricultural Department.

I have the honour to be,

Sir,

Your most obedient servant,

(Sgd.) FRANCIS WATTS,
Commissioner of Agriculture
for the West Indies.

6/1924.)

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Officer in Training	G. M. LOUGHEED.
Clerical Assistant to May 15	Miss L. E. LINLEY.
,, ,, from May 15 to May 31 ...	R. KING.
,, ,, ,, ,, 31	Miss D. E. WALL.

COTTON RESEARCH.

Provided by the Empire Cotton Growing Corporation.

Research Officer	L. H. BURD, B.A.

REPORT ON THE AGRICULTURAL DEPARTMENT, ST. VINCENT,

For the year ended December 31, 1923.

Work in the Botanic Gardens, and Observations on Plants.

The outstanding event for the year from a climatological view point was the excessive dry weather experienced. Only 79·50 inches of rain were recorded at the Botanic Gardens ; it was the driest year since 1894. Several palms were lost on account of this ; of these may be mentioned two specimens of Areca Catechu. As there are several other plants of this species growing in the Gardens, their loss is in no way serious.

The routine work of the Gardens was well maintained during 1923. The lawns, beds, borders, etc., received attention whenever necessary. The work of constructing concrete drains on the side of the central road was continued during the year. At the time of writing there is one on each side of the road and they have been the means of considerably improving the appearance of that part of the Gardens in which they are situated. Such work as this is of a permanent nature, and, as stated in the Annual Report for the year 1922, will be continued in the future.

The appearance of the St. Vincent Botanic Gardens could be considerably improved from a landscape gardening point of view. Such work, however, will have to be done in a most careful and judicious manner. For instance there are four Royal Palms (*Oreodoxa regia*) growing together, possibly originating from a poly-embryonic seed. They form a unique and handsome group ; these should, however, in order to be thoroughly appreciated, stand by themselves, instead of which they are partly hidden by other palms growing near to them. The situation is no way improved, at least not to a lover of trees, when it is stated that these "other palms" are in themselves extraordinarily handsome, and may be anything from 150 or more years of age. This instance is cited merely to give an example of the kind of problem that has to be faced when considering this question. There are many similar ones.

The Talipot Palm, (*Corypha umbraculifera*) mentioned in last year's report as having flowered, died during the period under review.

Photinia Japonica.

This is the Loquat or Japanese Medlar, and during the year it set one fruit. This is interesting in that, as far as the writer is aware, it is the first time that this tree has set fruit in the West Indies. The tree is native of Japan and is grown in the south of France and in some countries adjacent to the Mediterranean. Possibly the climate of this island is too hot for this tree to flourish, although not sufficiently so to preclude it from growing. The fruit as produced in St. Vincent was about one inch long, possessing a pleasant sub-acid flavour.

Elaeis guineensis.

This tree produces the palm oil of commerce, and there are several growing

in the St. Vincent Gardens. A point of possible economic interest is the sparse manner in which seeds are borne. This remark holds good not only for the trees growing in these Gardens, but also for those growing in the Antigua one.

Inocarpus edulis.

This tree bears the Otaheite, Tahite, or South Sea Chestnuts which are prized by the natives of the islands in which it is indigenous. In the St. Vincent Gardens there is only one specimen of this tree ; it flowers profusely, but only two fruit were formed during the year. This is the first record of Inocarpus fruiting in St. Vincent. Some authorities state that the seeds do not form a palatable food ; the taste, however, of those obtained during the year was rather pleasant, and one that, differing from so many tropical fruit, had not to be acquired.

The seed is borne in a flat kidney-shaped pod, each holding one seed. The tree grows to the height of from 60 to 80 feet, and forms buttresses, which, as the tree advances in age, extend some distance from it.

Work in the Nurseries and Distribution of Plants.

The following is a list of plants, seeds, etc., distributed from the nurseries attached to the Botanic and Experiment Stations, during the year :—

Economic and Decorative Plants.

Coco-nut	1,967
Timber trees	1,166
Miscellaneous decorative	378
Coffee	350
Bay	100
Mango (grafted)	50
Miscellaneous economic	45
	4,056

Cuttings.

Sweet potato	38,424
Cane varieties	16,070
Cassava	2,000
Miscellaneous cuttings	176
	56,670

Seeds.

Cotton	530 lb.
Ground nuts	550 „
Yam	507 „
Bengal beans	165 „
English vegetable	150 pkts.
Miscellaneous vegetable	2lb. 1oz.
Flower seeds	45 pkts.
Tubers	107
Broom corn	3 lb.

The number of plants distributed during the year under review was 1,47 less than that of the previous one, and the decrease was most pronounced in connection with coco-nut plants. This was due to the dry weather experienced, being such as to preclude the planting of extensive areas. Large numbers of th type of plant are in the nursery ready for distribution.

There was a marked increase in the number of cuttings and seeds sent out. ıe former amounted to more than three times the number distributed in 1922. ıe ratio of increase as regards seeds was approximately the same as that of mis-llaneous cuttings and sugar-cane seedlings.

A further lot of sugar-cane seedlings were raised during the year under re-ew, some 686 new varieties were obtained. The following gives the name of e parents and varieties :—

Parents.	Varieties.
Waterford 2	V. 1071 to V. 1392
B. 6450	V. 1393 „ V. 1470
B. 7924	V. 1471 „ V. 1524
B. H. 10 (12)	V. 1525 „ V. 1618
Sealy Seedling	V. 1619 „ V. 1681
Ba. 11569	V. 1682 „ V. 1713
B. 163	V. 1714 „ V. 1752
B. 154	V. 1753 „ V. 1757

During the year, for the first time on record, St. Vincent sugar-cane varieties ok their place in experiments on estates. It is hoped that the results obtained om these will be put forward in a subsequent report.

Sweet Potatoes.

A further lot of new sweet potato varieties were raised; results obtained from periments conducted with these and others will be found in another section of is publication.

Cassava.

The results of experiments conducted with new cassava varieties will be und on a subsequent page of this report.

Inspection and Fumigation of Imported Plants and Seeds.

The following is a list of plants, etc., which were inspected and fumigated der the Importation of Plant Diseases Protection Ordinance, 1906 :—

Ornamental Plants	...	11
Orchids	...	3 parcels
Oranges	...	6
Bulbs	...	6 parcels
Pea-nuts	...	11 bags
Vegetable and flower seeds	...	12 parcels
Cuttings	...	1 parcel.

Manurial Experiments at the Botanic and Experiment Stations.

Sea Island Cotton.

Manurial experiments of a nature similar to those conducted in 1922 were ain carried out during the season under report. It will possibly be remembered at these were co-operative in nature and were conducted on Montrose Estate, e property of Ormond Hazell, Esq., K.C. The thanks of the Department are ain due to this gentleman and to his son, J. H. Hazell, Esq., for the courtesy d kindness extended to Officers in carrying out the field work connected with ese experiments.

In these experiments there were five series of plots, each repeated four tir there being therefore, in all, twenty plots. Each plot was $\frac{1}{40}$ acre in area.

The land used was the same as that on which the previous trial had b made ; the plots received exactly the same manurial treatment as they did on previous occasion.

The plots in each series received the following treatment :—

Plots	1	... Control ; no manure.
,,	2	... Pen manure, at rate of ten tons per acre.
,,	3	... Green dressing.
,,	4	... Green dressing and Potash K^2O, at rate of 5 per acre.
,,	5	... Green dressing and high grade Nitrapo at rat 2 cwt. per acre.

Pigeon Peas were used for green dressing ; these were planted thickly rows, and were sown some seven weeks before being cut down ; they were sul quently turned into the land. The growth made by these peas was not good, account of the dry weather experienced soon after the seeds were sown.

All manures were applied on July 30th. Cotton seeds were sown on Aug 4. Reaping of plots was commenced on November 28, the final picking be made on January 25, 1924.

The results are put forward in the following table and are expressed pounds of seed cotton per acre :—

Plot.	Treatment.	Yield per acre seed cotton lb.	Mean yield per acre lb.	Increase on no-manure lb. per acre.	Percentag increase
1 a	No manure	1,047			
1 b	,,	1,512			
1 c	,,	1,432			
1 d	,,	560	1,138		
2 a	Pen manure, 10 tons per acre	1,377			
2 b	,,	1,707			
2 c	,,	1,610			
2 d	,,	630	1,331	193	16·9
3 a	Green dressing— Pigeon Peas sown thickly	1,125			
3 b	,,	1,480			
3 c	,,	1,470			
3 d	,,	700	1,194	56	4·92
4 a	Green dressing + Potash Sulphate 50 lb. K^2O per acre	1,300			
4 b	,,	1,465			
4 c	,,	1,040			
4 d	,,	800	1,151	15	1·32
5 a	Green dressing + 2 cwt. high grade Nitrapo per acre	1,435			
5 b	,,	1,577			
5 c	,,	1,045			
5 d	,,	1,000	1,289	151	13·27

The manure, Nitrapo, as mentioned above, contains 15 to 17% of nitrogen calculated as ammonia, and 15 to 17½% soluble potash.

The returns obtained from all the plots during the season under review were very much less than those for the previous one. There were two possible reasons for this, the first, and probably the primary one, was the indifferent growth of the dressing, which resulted in the application of only a small quantity of organic matter to three series out of the five. When the results as shown above for the pen manure plots are compared with the results obtained in 1922, there is only a difference of some five to six per cent ; the story is very different, however, when the results from series 3, 4, and 5 are compared in a similar manner ; there we find differences as high as 72%, 82% and 75%. These results appear to accentuate the need of organics in the St. Vincent soils. It is suggested that had a good cover been grown and turned in, much better results would have accrued.

The advent of the pink bollworm (Pectinophora gossypiella) during the year was another factor which accounted for decreased returns, but as all the plots were attacked equally severely, and probably all suffered approximately the same percentage of loss, this did not, from one view point, affect the results.

Maize (Indian Corn.)

Manurial experiments with maize were again undertaken. There were four series of eight plots each. In three of the four series the cobs were so severely attacked by birds, locally known as the Saint Vincent Black Bird, (Quiscalus luminosus) as to thoroughly vitiate the results obtained from three series. Consequently only results from one series are put forward. Seeds were sown on August 13, and the plots were reaped on December 22. The following table gives the kind of manures applied to the various plots, the calculated yield per acre of undried corn on cob, and the increased yields obtained from the plots receiving manures :—

Plot.	Treatment.	Calculated yield per acre green corn on cob lb.	Gain on no manure plot lb.	Percentage increase.
1	No manure	2,654		
2	Nitrogen, 30 lb. per acre as sulphate of ammonia	3,686	1,032	28·0
3	Potash, 30 lb. per acre as sulphate of potash	3,464	810	23·4
4	Nitrogen as above Potash „ „	3,908	1,254	32·1
5	Cotton seed meal, 1,000 lb. per acre	3,539	885	25·0
6	Potash as above and cotton seed meal as above	3,244	590	18·2
7	Pen manure rate of 20 tons per acre	4,276	1,622	37·9
8	Green dressing	4,646	1,992	42·9

Very considerable increases were obtained from the plots which received organic manures and those receiving nitrogen and potash. A good covering of pigeon peas was reaped and turned under in plot 8. This was buried seven days before the nuts were sown. In plots 5 and 6 cotton seed meal was applied at the rate of 1,000 lb. per acre The artificials were applied on September 12.

Ground Nuts.

Manurial experiments with this crop were again conducted. The same land as that used for similar work during the year 1922 was used. There were seven series, each containing three plots, therefore there were a total of twenty-one plots. The pen manure was applied to plots 7a, 7b, and 7c, one week before the seed was sown. Artificials were applied on August 22. The plots were rectangular in shape, each being approximately ⅓ acre in area ; the seeds were sown in these on August 24, and the nuts were harvested on January 3. Results are given below in terms of calculated yield per acre of undried nuts :—

Plot.	Treatment.	Yield per acre undried nuts lb.	Mean yield per acre undried nuts lb.	Percentage crease
1 a	No manure	1,108		
1 b	„ „	1,295		
1 c	„ „	296	900	
2 a	Nitrogen, 30 lb. as sulphate of ammonia.	1,295		
2 b	„	790		
2 c	„	1,141	1,075	19·4
3 a	Potash, 30 lb. as sulphate of potash.	1,273		
3 b	„	1,537		
3 c	„	395	1,069	18·7
4 a	Potash as above. Nitrogen „	1,426		
4 b	„	922		
4 c	„	1,065	1,138	24·6
5 a	Cotton seed meal 1,000 lb. per acre.	1,186		
5 b	„	1,515		
5 c	„	845	1,182	31·3
6 a	Cotton seed meal as above. Potash „ „	1,141		
6 b	„	1,229		
6 c	„	955	1,108	23·1
7 a	Pen manure, 15 tons per acre.	1,361		
7 b	„	1,186		
7 c	„	1,032	1,193	32.6

It may be stated, for the information of those who wish to convert the te undried nuts into that of dried nuts, that one is to the other as 100 is to 70·3.

From the above it appears that all of the plots which received organic m ure gave considerable increases over those obtained from the no manure plot. I manure applied at the rate of 15 tons to the acre gave an increase of 32·6 Cotton seed meal gave a 31·3 increase, while cotton seed meal and potash g an increase amounting to 26·4 %. Nitrogen applied as sulphate of ammonia g a 19·4 % increase. Potash gave gave an increase of 18·9 %.

MANURIAL SUGAR CANE EXPERIMENTS.

Manurial experiments were again conducted with sugar-cane. These w conducted on Diamond Estate, the property of A. Punnett, Esq. The thanks of t Department are due to this gentleman for his kindness in allowing the land to used for this purpose, and also for the assistance given to Officers when carrying the work. The canes were planted towards the end of October and reaped on Ap 14 and 15. Manures were applied on August 7. The plots were in triplica In the following table the results are put forward calculated to tons of cane p acre. The means are put forward, the actual differences obtained from plots, compared with the no manure plot, and the percentage increase on no manure.

Plot. No.	Treatment.	Calculated yield per acre. Tons per acre.			Mean.	Difference on no manure. Tons.	% increa on n manur
		Series I.	Series II	Series III.			
1	No manure ...	15·00	15·07	19·04	16·37		
2	Nitrogen, 30 lb. as sulphate of ammonia ...	21·36	17·11	17·29	18·59	2·22	13·6
3	Potash, 30 lb. as sulphate of potash ...	22·04	7· 89	17·25	19·06	2·69	16·4
4	Nitrogen and potash as above ...	23·04	19·89	18·18	20·37	4·00	24·4
5	Cotton seed meal, 1,000 lb. per acre ...	27·21	17·53	17·68	20·81	4·44	27·1
6	Cotton seed meal, 500 lb. per acre, nitrogen, 35 „ potash 35 „ ...	29·04	24·50	20·61	24·72	8·35	51·0
7	Pen manure, 20 tons per acre ...	28·93	19·18	16·29	21·47	5·10	31·2

From the above it will be seen that the increases of from 13 % to as much as 51 % were obtained by the use of manures. The greatest increase was that obtained from the plots which received cotton seed meal at the rate of 500 lb. per acre, combined with nitrogen and potash. This was followed by the plots which received pen manure where the increase over the no manure plots was 31·2 %. It might be said, at this juncture, that planters in some of the Northern Islands aim to give to all cane fields when planted a dressing of pen manure equal to this. Cotton seed meal applied at the rate of 1,000 lb. per acre gave an increase of 27·1 % over the return from the no manure plots. Other increases as seen from above were 16·4 % and 13·4 %.

Cotton Research.

The following section from "The Pure Lines of Cotton" to "Flowering Records from Country Plots" was written by Mr. L. H. Burd, B.A., Cotton Research Officer, St. Vincent.

The Pure Lines of Sea Island Cotton.

The nine strains which were grown last year have been continued and a statistical analysis made of the various measurable characters; nothing new has arisen in connection with this branch of the work.

Mode of Inheritance of Maximum Lint Length.

The genetic work on this subject has been continued, and an F^2 generation of over 1,000 plants from the cross made 1921-22 has been raised this year. The mean maximum lint length of each plant has been determined, (in addition to lint index and ginning out-turn) a task of considerable magnitude. The P^1, F^1 and F^2 data are presented graphically. As will be noticed, the F^2 distribution is not by any means uniform, but displays considerable skewness and multimodality. A tentative explanation of the phenomena on mendelian lines is put forward—but it must be made clear that the explanation is only suggested, and, though very attractive, nothing can as yet be said to be proved.

In the first place, Gossypium barbadense chromosomes appear to be tetraploid, *i.e.*, to have 26 as their haploid number and not 13 as do the Asiatic Cottons. Hence we may expect a doubling of factors, so that if A or B represents factors for long lint, and a or b their normal allelomorphs for short, then two original parents may be represented as

long, AABB. short, aabb.

With the F^1 as AaBb.

The experimental data show that the F^1 length is not exactly intermediate between the two parents, but that if we assume a value of 0 for short, and 2 for long, then the F^1 has a value of 1·170 and not 1 exactly; *i.e.*, the long is partially dominant over the short. Expressed numerically A is dominant over a, or B over b) by the value 0·585. The figures are calculated from the means of the P^1 and F^1 populations. On this assumption the F^1 gametes will have length forming values as follows,

ab	=	0·000.
Ab, aB	=	0·585.
AB	=	1·000.

So that in F^2 we should have

	Length value.	Frequency.	
AABB	2·0	1	1.
AABb, AaBB	1·585	2, 2	4.
AAbb, aaBB, AaBb	1·170	1, 1, 4	6.
Aabb, aaBb	·585	2, 2	4.
aabb	0	1	1.

This should give an F^2 distribution with 5 unequally spaced nodes. Fl tuations would tend to obscure these nodes, and, where they were very cl might obliterate them entirely. The actual F^2 distribution seems to give very good fit with this theoretical forecast, which, it should be noticed, has b built up from the F^1 and *not* from the F^2 data.

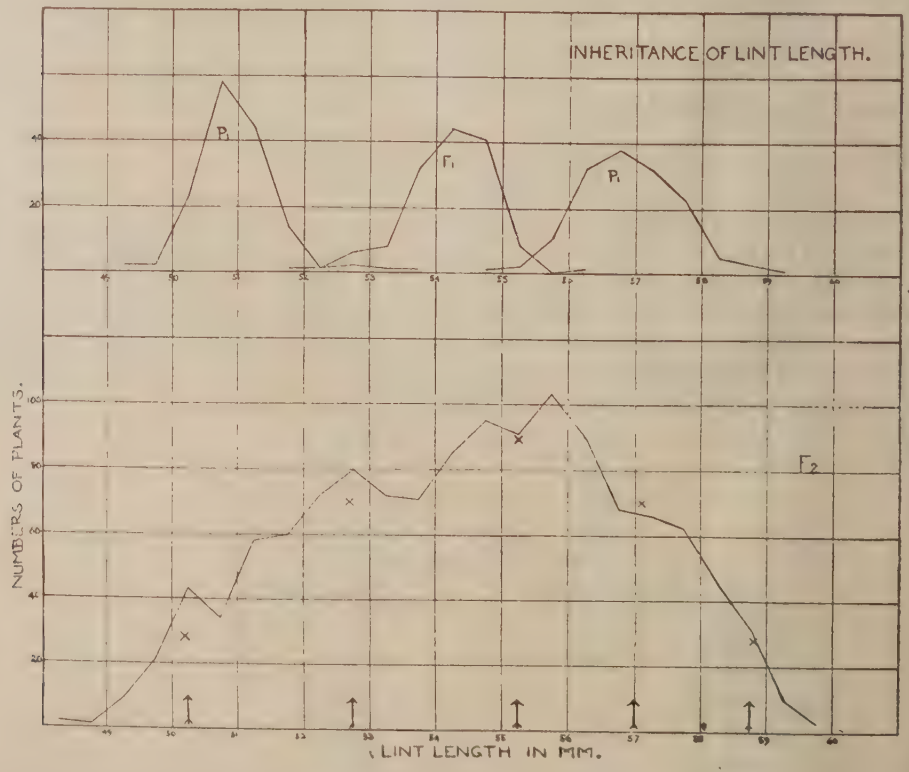
Further, the original parents differed not only in lint length, but also in l index. The negative correlation which usually exists between these two char ters appears to be absent from this F^2, there being several plants possessing l lint and high lint index. It is to be hoped that these plants represent n gametic combinations, and are not merely unfixable fluctuations.

The Work of the Sorter.

By the use of this machine, which was mentioned in last year's report, a n method has been established for estimating the number of hairs per seed, u which the ginning out-turn ratio is dependent. It has also been found possi to arrive at an approximately accurate numerical estimation of uniformity of l length in cottons, which could if necessary be applied to other fibres. A f account of these researches will be published elsewhere.

Future Genetic Work.

Care and time have been devoted during the past season to collecti material for future research in pure genetics. Types have been obtained whi will probably enable work to be initiated on the following characters :—Prese and absence, size and depth of the petal spot ; various shades of corolla ; st colour and hairiness ; node of first fruiting branch ; united or free bracts ; fuz or naked seed.



The arrows denote the position, and the crosses the approximate height of the Nodes required by the suggested theory.

Plant Development and Crop Analysis.

An attempt has been made to set up a series of observations on plant development and crop behaviour which will serve as standards to which future data can be referred. By the systematic collection of such records from year to year, it should be possible not only to explain accurately the reason for any variation in yield, which may occur, but also to forecast the actual size of the crop by several months, and with a fair degree of precision. The methods used were originally evolved by Balls in Egypt, but only such conclusions and statements will be used here as have actually been tested and found to hold for St. Vincent. Inasmuch as the method, though not new, is probably not familiar to cotton growers in the West Indies, a comparatively detailed account will be given, though it is not suggested that planters themselves should attempt to collect the necessary records, this being purely the function of experiment stations.

The data collected have been summarised in the form of curves, and it will be convenient to consider each of these separately, and to discuss the relationship of one to another as we proceed.

All the observations were made on a group of 112 plants of the pure strain S.F. which were being grown as a single plot in the Variety Test.

The Growth Curve.

From 28th August, 35 days after sowing, until October 27th, when it was clear that growth had ceased, a careful measurement was made of the height of each plant every morning, beginning at 7 a.m.

Measurements were made to the nearest millimetre, from an ink mark at the cotyledonary node to the terminal bud. The figures were then totalled and expressed as centimetres elongation of the average plant per day, or "Cms p.p.p.d" The daily variations in increase have been smoothed out by an overlapping system of averaging, and the final figures plotted as below.

It is apparent that growth rate starts slowly, increases to a maximum and then declines. The ideal form for a plant growing under optimum conditions would be a smooth curve as indicated by the dotted line, the actual departures from this being due to the various vicissitudes of environment. Most noticeably there were checks in growth around September 7, 24 and October 6. These checks seem to be associated with excessive humidity but the precise causal relationship between the humidity and the plants is not quite clear.

Mason considered that, on wet days when there was no evaporation, normal transpiration could not take place through the leaves; Harland on the other hand considered that water-logging of soil around the roots was the sole cause. In the light of further experience, it seems that both these causes may be operating.

The Flowering Curve.

As soon as flowering began, the number of flowers opening was recorded daily, and figures expressed as the number of flowers opening per average plant each day as "flowers p.p.p.d." (Note, as the open flower stage only lasts one day, there is no difficulty in distinguishing the flowers of any one day from those of the previous or following days.) The daily flowering figures were then smoothed by the same averaging method, and plotted as flowers p.p.p.d.

The form of the curve is roughly the same as that for growth, and also shows depreciation from the normal (indicated by dots).

These checks are due not to the environment at the time of flowering but to checks in growth, which occurred 28 days previously. So much is this the case that unsmoothed flowering and growth curves coincide when a shift of 28 days is made. From this and other considerations it is known that the mean time taken from the laying down the primordia of a flower bud to the opening of a flower is 28 days, with a limited degree of fluctuation in either direction.

Actually the fitting of the two curves is never perfect, partly on account of this fluctuation, but chiefly on account of the bud shedding.

However, this fitting of curves is in itself of no particular importanc What is valuable is that checks in flowering can be forecasted by 28 days, *if* w *know the growth curve.* Also the rate of flowering indicates the *maximum* si of potential crop, since size of crop depends on number of bolls, and maximu number of bolls is obviously determined by maximum number of flowers.

The Shedding Curves.

Soon after flowering began, the shed found on the ground in the furrow were picked up and counted, and the figures dealt with and expr ssed in the sam manner as the flowers, as sheds p.p.p.d.

The data are necessarily not so accurate as for flowering, for some of the shed are certain to have been overlooked, but for comparative purposes they answ very well. The form of the curve is of no particular importance. It represent and dates the majority of the losses which intervene between flowering and bollin

The Bolling Curve.

As soon as boll opening began the cotton was picked daily, and the numbers o bolls opening each day were recorded. These records again are not so accurate a for flowering, since there is a certain amount of subjectivity involved in decidin whether or no a particular boll is open, for although any one can easily recogni the fully opened boll with dry and reflaxed bracts, when the boll begins to open it not easy to decide whether it shall be assigned, say to to-day or to-morrow. A before the data have been smoothed and expressed as bolls p.p.p.d. This curv is of prime importance since the number of bolls, in conjunction with weight o lint per boll, determines the size of the crop. Since the mean time of developmen from flowering to opening is constant, (54 days for strain B. F.) it follows tha unless the shedding of young bolls be very severe, then the form of the bollin curve will be the same as the flowering curve, *i.e.*, the rate of bolling is mainl pre-determined by flowering, and checks in bolling can thus be forecasted by 5 days.

The early depressions in the boiling curve are *not* due to the adverse fluctua tions in the weather which occurred at the time of opening, but to flowerin checks 54 days previously. But these checks in flowering, we have already seen are due to previous checks in growth, so that the cause of the checks in bollin which centered round November 26 and December 4 is largely to be found in th unfavourable conditions for growth around September 7 and 28, or 54 day previously. Thus we can forecast checks in bolling even before the crop has begu to flower.

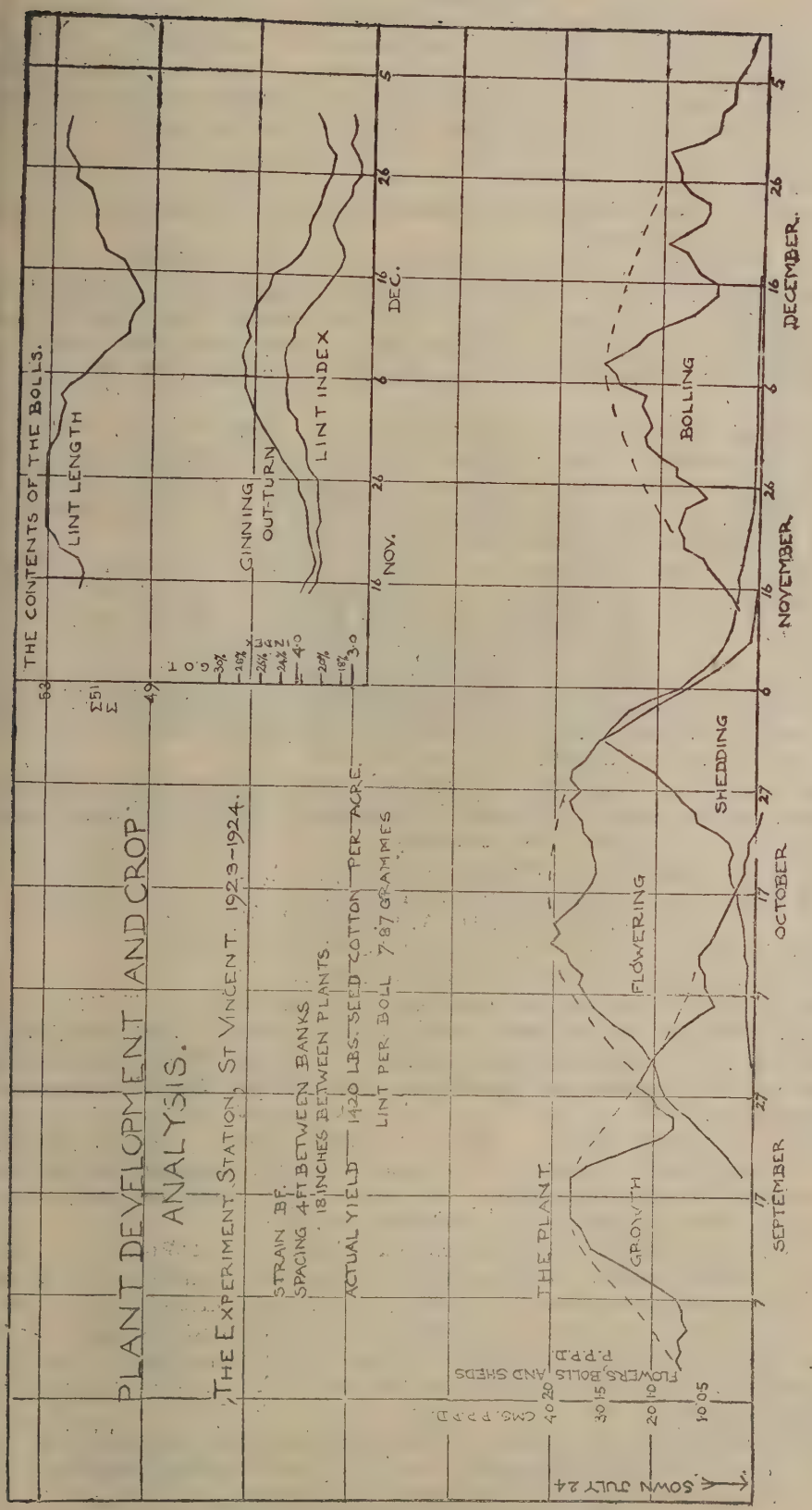
The importance of such knowledge cannot be over estimated. When th data have been collected systematically for a few years it may be possible to fore cast the size of the crop within certain limits from the growth curve alone, infor mation which will obviously not be without its uses.

The Contents of the Bolls.

Daily pickings from dated flowers have shown that considerable variations i lint length and ginning out-turn occur from day to day. It has been ascertained that during the season under review a marked depreciation in lint length is caused by heavy rainfall during the critical stage in lint length formation which occur 19 days after flowering, *i.e.*, such depreciation can be forecasted by 35 days (ful account of this action will be published elsewhere).

Ginning out-turn rises during the middle of the season, and falls agai towards the end. These variations are directly due to variations in the numbe of hairs per seed which in turn are probably due to internal physiological reason and not to variations in environment.

(It will be noticed that throughout the discussion of forecasting and develop ment, no mention has been made of what is locally termed the "second picking" Whether such cotton could ever be reaped was always problematical and, in view o the advent of the pink bollworm, it seems likely that in the future it will have t be disregarded altogether).



Checks in growth due to excessive humidity.
Checks in flowering due to checks in growth 28 days previously.
Checks in bolling due to checks in flowering 54 days previously, and to shedding.
Bolling and lint per boll determine size of crop.
Lint length degraded by excess rainfall during critical periods (19 days after flowering).
inning out-turn variations caused by variations in number of hairs per seed.

The Variety Test.

The nine pure strains previously mentioned have been subjected to an exhaustive comparative test during the last season. It was felt that this was necessary as many of the strains are probably superior to those at present grown over the island, though very little was known of their relative powers of performance. The full data are far too extensive for publication but may be seen at the Experiment Station by any one interested. The following is a brief summary of the results :—

Flowering. By total number of flowers produced the strains may be placed in order of merit as follows :—

V., A. J., A. N., C., D., B. D., A. E., B. F., H. 23.

A. J. was markedly superior until October 14, after which V. led. All the curves have two maximums, at October 14 and 26. The strains differ widely between these dates, but become more and more similar as the flowering curve falls. There is a difference of about 4 days between the earliest (A. J.) and latest (H. 23) maturing strains.

Shedding. Curves broadly similar except A. J., which rises very much higher than the remainder. There is evidently some positive correlation between the number of sheds and the number of flowers. In general the percentage of shedding seems to be less than that found by Harland and Balls. Possibly they were working with heterogenous populations, and not with pure strains.

Bolling. All the curves were very irregular, on account of checks in flowering and to waves of boll shedding. As in flowering A. J. leads at first but soon loses its superiority. By total number of bolls produced, order of merit is

D., A. N., C., B. D., A. E., H. 23., B. F., V., A. J.

Seed cotton. By actual yield all strains produced at the rate of over a bale (360 lb. lint) to the acre. The order of merit for seed cotton production will not be the same as that for total of bolls, chiefly because of inter-strain variation in weight of seed cotton per boll.

Lint. Variations in ginning out-turn and weight of lint per boll will again vary in the order of merit. The method of treatment which probable estimates the performance of the plant most accurately is

"Total bolls produced × mean lint per boll".

This places the strains in the following order:—

B. D., A. N., C., D., A. E., A. J., B. F., V.

Unfortunately we have no figure for H. 23 for lint per boll.

The strain's probable position is about fourth.

The following summarises the performance of each strain :—

B. D. Flowering rate not conspicuously high. Maximum 2·04 flowers. *p. p. p. d. Shedding 34%. Bolling normal. Superior on account of its high weight of lint per boll (1·02 grams) and ginning out-turn (28%.) Mean maximum lint length 51·5 mm.

A. N. Flowering normal. Maximum 2·26 flowers p. p. p. d. Shedding 34%. Bolling normal. Recognised for some years as a superior yielder, which yield is almost due to a high ginning out-turn (32%.) Lint per boll also high (96 grams.) Mean maximum lint length 50·3 mm.

C. Flowering reaches a higher maximum than most (2·3 p.p.p.d.). Shedding 32%. Bolling normal. Quite a recent isolation and probable not yet pure.

D. Flowering low at first, but rises to a maximum of 2·05 p.p.p.d. Shedding low 25%, and so produces more bolls per plant than any strain. Ginning out-turn 24%. Lint per boll ·802 grms. If this low shedding quality could only be combined with the high ginning out-turn of A. N, a very high yielding strain should result.

A. E. Flowering a little low. Maximum 2·08 p.p.p.d. Shedding low 27%. Bolling higher than most, especially towards the end of the flowering period. Ginning out-turn good (27%.) Lint per boll ·884 grams.

*(p.p.p.d. = per plant per day.)

A. J. Start of flowering markedly higher than all other strains, but towards the fall becomes lowest, probably on account of excessive bud-shedding. Shedding very high, 44%. Bolling, as flowering with the fall markedly increased on account

of shedding. Ginning out-turn high, but this does not compensate for the very heavy shedding.

B. F. Flowering low, maximum 1·96 flowers p.p.p.d. Shedding 30·5%. Bolling also on the low side. Valuable for its high number of loculi per boll, (mean per plant 3·69) but in general as a yielder does not come up to expectations. Ginning out-turn 26%. Lint per boll ·787.

V. (V. 135.) Very high flowering rate, maximum 2·58 p.p.p.d. Shedding 32·7% Bolling not much above average. Not a high yielder on account of low ginning out-turn and lint per boll. Valuable on account of its extreme length of lint, 57 mm. (or $2\frac{1}{4}$ inches.)

H. 23. Flowering low at first. Somewhat resistant to shedding. (28·4%.) Bolling normal. Ginning out-turn and probably also lint per boll are high, which makes it a good yielder.

Samples of all these cottons have been sent to the Fine Cotton Spinners and Doublers Association, for spinning tests. The results of these tests, taken in conjunction with the above, should prove very valuable.

One or Two Plants per Hole ?

Another attack on this time worn problem was made this year. As is well known, the question has already been investigated many times in the West Indies, notably by Harland and Robson, and although the results of both these workers pointed to a marked increase in yield due to the two to a hole method of planting, their experiments were by no means planned on the best possible lines, and errors from a large number of sources may have crept in. Harland, for instance, had alternate rows of one and two plants per hole, so that it is obvious that the plants in the dense system enjoyed a greater soil volume around their roots than would have been the case had the adjacent rows been two plants per hole ; a serious objection. Under these circumstances a repetition seemed desirable.

Material and Method.

Eight rectangular plots of the pure strain A.N. were arranged chess-board fashion, four of which were two per hole, the banks being four feet apart, and the holes 18 inches on the banks.

Flowering, shedding and bolling records were obtained for each plot as well as figures for total yield. The usual care was taken in avoidance of marginal errors by excluding all outside plants from the observations.

Results and Conclusions.

Flowering was markedly superior in the two plants per hole plots until October 12. (see curves). Boll shedding was heavier also, but this was to be expected since there were more bolls capable of being shed ; the percentage of shedding to flowers produced being about the same in both series. Bolling is irregular even after smoothing, but shows superiority in the two per hole plots until December 8.

The total yield by bolls is as follows:

Two per hole,	Plot.		
	1.	... 6808.	Mean = 5944 ± 14·56%.
	4.	... 6412.	
	5.	... 6527.	
	8.	... 4028.	
One per hole,	2.	... 5868.	Mean = 5386 ± 4·26%.
	3.	... 5333.	Difference = 10·4%.
	6.	... 5067.	
	7.	... 5277.	

Plot eight is clearly abnormal, and if we omit it from the calculation then,

Two per hole, ... mean = 6582 ± 2·12%.

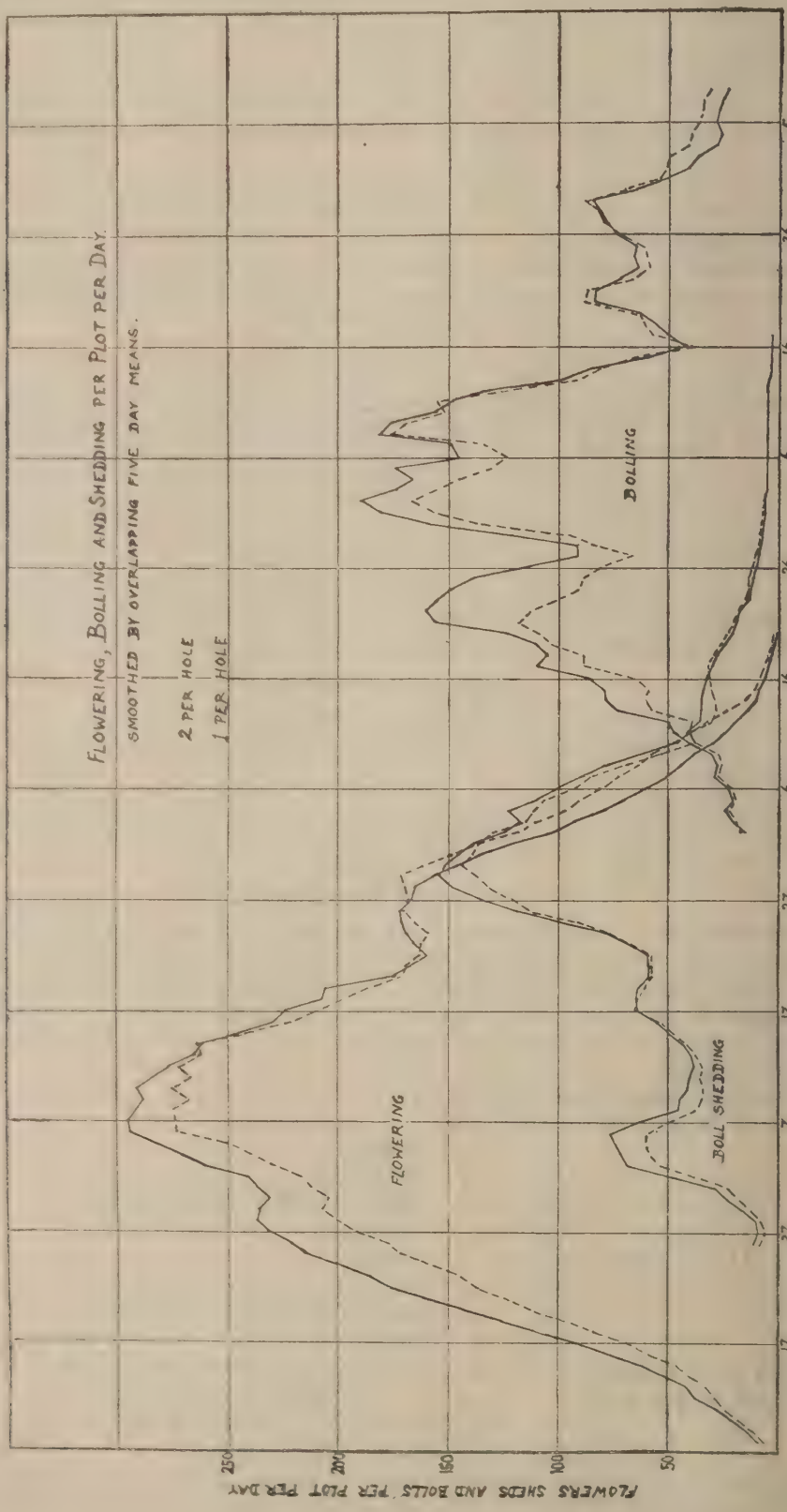
One „ „ ... ... „ = 5386 ± 4·26%.

Difference 22·2%. P.E. diff:=4·7%

The odds against such a difference being due to random causes are over 20 : 1.

The increase of 22·2% due to 2 per hole planting is almost exactly the same

as that found by Harland and Balls, so that it may be taken as establish
the two per hole method does, without doubt, give an increased yield per
about 20%.



Soft Rot Infection.

An attempt was made to find out the effect of the two plants per hole method
ne incidence and spread of the soft rot disease. (Phytophthora spp.) To
end, as soon as infection was noticed to have begun, a record was made of
xact position and number of bolls observed to be freshly infested each day
l of the plots used in this experiment. Such records are difficult and
us to obtain, and are probably inaccurate as representing the actual total
nt of infection, but nevertheless they are believed to be of value in indicating
elative amount of infection on the different plots.

From the early positional data, a plan was made showing exactly where the
tion first occurred and the manner of its spread. From this plan it appeared
infection started sporadically all over the entire series of plots and did not
merely to spread outward from a few infection centres; when we consider
the bolls to be infected are always those on the lower fruiting branches,
two facts together indicate strongly that the fungus can exist from one year
other in the soil, and that the first infections each year are usually derived
this source.

The total data for the plots when observation ceased were as follows:—

Two per hole,	Plots.			
	1.	...	... 121.	Mean = 172 ± 21·6%.
	4.	...	... 164.	
	5.	...	... 153.	
	8.	...	... 250.	
One per hole.	2.	...	... 218.	Mean = 260 ± 9·8%.
	3.	...	... 241.	
	6.	...	.. 292.	
	7.	...	... 288.	

Difference = 45·3%.

There seems to be a marked reduction in soft rot due to leaving the plants
to a hole. The result is surprising, and it has not been found possible to
e at any satisfactory explanation of the phenomena. The work needs re-
ng.

Cytology.

Since chromosomes are almost certainly the bearers of hereditary units or
delian factors, some investigations of their number and behaviour in cotton
ed desirable.

Examination has shown that the normal number for G. barbadense is un-
otedly haploid, 26 (not 20 as stated by Babcock and Clausen).

A male sterile rogue plant has arisen in which the number appears to be
ant, but further work is needed before this can be stated with certainty (A
minary account of this is published elsewhere).

Flowering Records from Country Plots.

An attempt was made to establish small plant observation stations on the
ward and Windward sides of the Island, but various circumstances combined
ented more than a humble beginning being made. In the end complete flower-
records for a small group of plants were obtained from Buccament and
getown, and a partial record from Barrouallie. As the cultural conditions of
tations varied greatly and were in some respects abnormal, no deductions as
mparative yield can justly be made from the amplitude of the curves, but it
been possible to deduce with some degree of certainty that the checks in
ering occur as a rule on the same day throughout the island.

The point is of some importance, since it supports the idea that performance
ds from the Experiment Station will really be applicable to estate grown
n, and thus enhances the probable utility of systematic plant development,
crop analysis records.

Experiments with Ground Provisions.

Yams Varietal Experiments.

Varietal experiments were again undertaken with nine varieties of y
There were two plots of each variety planted, each plot being 160 square fe
area. The distance between the plants was 4 feet x 3 feet or at the rate of 3
holes per acre. Plots were planted on June 24 and reaped on January 6.

The results from the trials are put forward in the following and are c
lated to lb. of tubers per acre :—

Variety.	Calculated yield per acre.		Mean.
	lb.	lb.	
Seal Top ...	17,690	4,628	11,159
Lisbon ...	11,162	6,806	8,984
Danish ...	8,167	7,623	7,895
Bottle Necked Lisbon...	7,351	7,895	7,623
Crop ...	4,900	8,984	6,942
Horn ...	7,623	5,173	6,398
Light Red ...	4,900	7,623	6,262
Bugle Horn ...	4,628	6,806	5,717
Oriental ...	5,989	3,811	4,900

The above requires but little comment, but it might be said that the va
Horn which has done well in the past takes a place of indifference in the al
Lisbon appears to be consistently a good yielder.

Staking Experiments.

The same varieties were used for this experiment as were used for the
ceding one, and in both instances the sizes of the plots were similar. Planting
reaping took place at the same time.

In the following table the average results from two plots, calculated to
of tubers per acre, are given :—

Variety.	Unstaked plots: yield per acre, lb.	Staked plots: yield per acre, lb.	Increase or decrease of staked on unstaked per acre lb.
Bottle Necked Lisbon...	7,623	13,204	Plus 5,581
Lisbon ...	8,984	9,529	,, 545
Horn ...	6,398	9,801	,, 3,503
Crop ...	6,942	10,482	,, 3,504
Seal Top ...	11,159	16,608	,, 5,549
Light Red ...	6,262	9,212	,, 2,950
Oriental ...	4,900	4,628	Minus 272
Bugle Horn ...	5,717	7,246	Plus 1,529
Danish ...	7,895	3,675	Minus 4,220

If the plus figures and minus figures are separately totted up we find
the first indicates an increased yield of 23,197 lb., the second a decrease of 4,
lb.,—a difference of 18,704 lb. In similar experiments conducted in 1922 incre
yields were obtained from all the staked varieties, and it may be generally ta
that increased yields are usually obtained when yams are staked.

Sweet Potatoes Varietal Experiments.

The following experiments were laid out so as to test the sweet potato va
ties which gave the best yields in the trials conducted in 1922, against

other, and also against two standard varieties. Each variety was planted in ur different plots, each series of plots represented a group. In the results the eight obtained from each plot is put forward and calculated to lb. of potatoes r acre. The mean yield from each series is recorded in a similar manner. ch plot was 80 square feet in area, and the cuttings were planted on August 11 d reaped on February 18.

Variety.	No. of plot.	Calculated yield of roots per acre in lb.	Mean yield per acre lb.	Percentage increase or decrease on	
				Daggit.	Emma.
1. V. 94	1	32,791			
	2	33,062			
	3	36,314			
	4	10,298	28,116	+52	+54
2. V. 52	1	27,642			
	2	20,867			
	3	28,996			
	4	34,688	28,048	+52	+54
3. V. 103	1	31,978			
	2	35,772			
	3	21,138			
	4	16,802	26,423	+49	+51
4. V. 74	1	22,764			
	2	30,622			
	3	24,661			
	4	18,157	24,051	+44	+46
5. V. 79	1	22,764			
	2	24,661			
	3	26,289			
	4	20,054	23,442	+43	+45
6. V. 81	1	18,970			
	2	18,757			
	3	17,344			
	4	8,401	15,868	+15	+15
7. V. 73	1	14,463			
	2	21,409			
	3	17,615			
	4	9,485	15,718	+15	+17
8. Daggit	1	16,531			
	2	6,504			
	3	12,737			
	4	17,886	13,415		
9. Emma	1	24,932			
	2	7,043			
	3	7,317			
	4	12,737	13,007		
10. V. 116	1	14,072			
	2	10,840			
	3	7,588			
	4	19,241	12,940	—4	—8
11. V. 82	1	20,054			
	2	10,027			
	3	7,317			
	4	10,569	11,992	—1	—8

Out of the eleven varieties tested some gave very considerable returns c those produced by the standard ones. The first two in the table gave yi more than twice that produced by either of them and should be of considera value to potato growers. The varieties V. 52 and V. 94 have in previous tr given good yields. They both seem to be a valuable acquisition.

A further series of varietal experiments were conducted, but the weat experienced was so dry that the results obtained were very poor and no us purpose would be served by putting them forward in detail. It may be s however, that, of the fourteen varieties experimented with, V. 53 gave hea yields than any.

Ground-nuts. Varietal Experiments.

Varietal experiments with ground-nuts were conducted during the pe under report. Three imported varieties were tested against the local one; t were Virginia Bunch, Improved Spanish, and African. In these experim there were four series laid out and in each with one exception four plots v planted; in the exception mentioned there were only three plots. Seeds v sown on July 28, and the plots were reaped on November 22; the area of plot was 180 square feet. Seeds were planted 6 inches from one another in d 3 feet apart.

Results calculated to undried nuts lb. per acre are given in the following

Variety.	No. of plot.	Calculated yield per acre ground-nuts. lb.	Mean yield.	Increase or decrease on local variety.	Percentage increase or decrease.
Local ...	1	1,694			
	2	1,754			
	3	1,754			
	4	1,026	1,557		
Virginia Bunch ...	1	1,815			
	2	1,632			
	3	1,178			
	4	1,390	1,504	Minus 53	Minus 3·4
Improved Spanish ...	1	1,331			
	2	968			
	3	1,212	1,170	„ 387	„ 24·9
African ...	1	1,512			
	2	2,783			
	3	1,026			
	4	2,052	1,843	Plus 286	Plus 18·4

It will be seen, when comparing the results obtained as shown above, two of the varieties, Virginia Bunch and Improved Spanish, did not give y as good as those obtained from the local variety, and the variety "African" yields at the rate of 286 lb. more per acre.

Attempts were made to raise new varieties of ground-nuts; they, howe were not successful but will be continued in the future.

Experiments with Cassava Cuttings.

The experiments conducted with cassava cuttings during the period u report were not of such an elaborate nature as those discussed in the Repor this Department for 1922. The number of plots planted was twenty-four, tw of which were planted with cuttings 8 inches long and the remainder with tings 2 feet long. Each plot was 300 square feet in area, and the plots planted on June 15 and reaped on April 4. The yields as put forward are ca lated to lb. of roots per acre. The column on the right of the table gives differences in yield obtained from the two methods. In all cases these wer favour of the plots that were planted with the cuttings 2 feet in length.

Plot.	Calculated yield of roots. lb. per acre.		Difference in favour of long cuttings lb. per acre.
	Yield from short cuttings.	Yield from long cuttings.	
1	10,745	12,332	1,587
2	8,421	16,843	8,422
3	14,230	19,457	5,227
4	8,421	14,084	5,663
5	10,164	13,213	3,049
6	9,438	18,876	9,438
7	9,728	18,150	8,422
8	11,616	22,216	10,600
9	10,745	17,279	6,534
10	9,874	16,843	6,969
11	15,536	19,602	4,166
12	9,728	19,747	10,018
Means	10,721	17,387	6,675

Taking the calculated mean of the differences we see that this amounts to 675 lb. and they ranged from 1,587 lb. to 10,600 lb. Figures, that on the whole, e in no way insignificant.

Cassava Varietal Experiments.

It will possibly be remembered that in 1922 experiments of a tentative nature re conducted with recently raised cassava varieties. In these they were tested ainst each other but not against, or with, any standard local variety. During e period under review they, however, were so tested, and the local varieties at were introduced into these trials were Brown Stick, White Stick and Bois est. Four plots of each of these were grown and the area of each was 120 uare feet or $\frac{1}{363}$ of an acre. The sticks or cuttings were planted 2 feet apart banks 4 feet wide. The date of planting was November 24, 1922, the plots re reaped on December 5, 1923. The calculated yield of tubers per acre from e three standard varieties were Bois West 26,862 lb., Brown Stick 36,564 lb. d White Stick 44,105.

The results are given below and are calculated to lb. of tubers per acre.

iety.	Plot.	Calculated yield per acre. lb.	Mean yield per acre. lb.	Difference in yield when compared with Bois West per acre. lb.	Difference in yield when compared with Brown Stick per acre. lb.	Difference in yield when compared with White Stick per acre. lb.
33	1 a	25,047				
	2 a	26,862				
	3 a	19,963				
	4 a	26,136	24,502	minus 2,360	minus 12,062	minus 19,603
4	1 b	33,759				
	2 b	29,040				
	3 b	23,232				
	4 b	23,232	27,316	plus 454	plus 9,248	„ 16,789
5	1 c	18,150				
	2 c	16,698				
	3 c	24,648				
	4 c	26,862	21,599	minus 5,263	minus 14,965	„ 22,506
6	1 d	29,040				
	2 d	21,780				
	3 d	26,862				
	4 d	23,232	25,229	„ 1,633	„ 11,335	„ 18,876
11	1 e	24,684				
	2 e	34,122				
	3 e	20,499				
	4 e	24,321	25,907	„ 955	„ 10,657	„ 18,198

The results as put forward in the above table indicate that the standa varieties gave, except in one instance, better returns than those obtained from t new seedlings ; and in the one instance cited the increase was almost of a neg gible character. It should be stated that results such as those put forward mu in some cases, be expected, but the work is of sufficient importance to be continu in spite of this, the value of the cassava industry to St. Vincent being such to warrant further attempts being made to raise a variety which may give bett returns than the standard ones.

Sugar-Cane Varietal Experiments.

Experiments with sugar-cane varieties were again undertaken. These we laid out on Pembroke Estate, the property of J. Punnett, Esq. The varieti were planted in rows and each row was regarded as a plot, each plot being acre in area. All of the varieties were planted in duplicate with the exception the variety B. 147. Of this three plots, contiguous to each other, were plante and the middle one was reaped. As is well known the variety under discussi makes but slow growth for some time after it is planted, and, if grown near var ties which make rapid growth in their early stages, it is handicapped on account shade, etc., formed by them.

Seventeen varieties were experimented with ; these were the same as the experimented with during 1922, with the exception that one new variety was i troduced, *i.e.*, B. 154. The field in which these trials were made did not recei any manure ; it had lain fallow for a considerable number of years and was in moderately high condition of fertility.

The procedure adopted in connection with these experiments was exactly t same as that for those conducted in 1922. The canes from a known area und each variety, *i.e.*, $\frac{1}{40}$ acre, were harvested and weighed, and from each plot 100 of canes were obtained, taken to the mill and crushed : the juices obtained fro these were weighed. Subsequently the juices were taken to the laboratory and t density obtained by means of a Brix Hydrometer. It should be stated that amounts of sucrose so obtained are not absolutely correct, as the total solids cane juices are not entirely sugar ; the results are, however, sufficiently accura for practical purposes. They are put forward in the following table as tons of ca per acre, gallons of juice per acre, gallons of juice per ton, pounds of "sucrose" p gallon of juice and pounds of "sucrose" per acre. In obtaining some of this da use was made of the tables dealing with the specific gravities of cane juices, whi appear in the West Indian Bulletin, Vol. 14, page 193.

The plots were planted on November 11, and were reaped on May 10–16.

No. and name of cane.	Mean of 2 plots cane.	Juice.		"Sucrose."	
	Tons per acre.	Gallons per acre.	Gallons per ton.	Lb. per gallon of juice.	Lb. per acre in juice.
Scaly Seedling ...	38·0				
B.S.F. 12 (27) ...	35·9	4954·2	138	2·12	10,568
B.S.F. 12 (45) ...	35·4	4781·6	139	2·10	10,359
B. 147 ...	32·3	4392·8	136	2·18	9,647
Ba. 11569 ...	24·2	3363·8	139	2·81	9,464
B. 164 ...	23·2	3155·2	136	2·79	8,809
B. 163 ...	23·2	3487·2	136	2·79	8,809
Ba. 12079 ...	28·7	3803·2	136	2·24	8,782
Black Savage Transparent ...	23·9	2083·1	129	2·80	8,699
B. 6450 ...	26·1	3599·8	138	2·16	7,804
B. 154 ...	25·8	2546·2	137	2·19	7,802
Ba. 11403 ...	17·6	2340·8	133	3·28	7,698
B.H. 10 (12) ...	22·6	3051·0	135	2·23	6,829
B. 7924 ...	20·1	2814·0	140	2·10	5,947
Waterford No. 2 ...	14·1	1945·8	138	2·11	4,115
B. 6,308 ...	12·6	1764·0	140	2·13	3,772

The juices obtained from the variety Scaly Seedling were unfortunately lost.

The results as appearing in the above table are somewhat different from those obtained in the trial made in 1922. This was to be expected as one was conducted on an estate situated in a dry section of St. Vincent and the other was carried out in one of the rainest districts. The variety which gave the heaviest yield per acre was Sealy Seedling. This cane in West Indian islands other than St. Vincent has the reputation of possessing qualities enabling it to withstand drought conditions ; it is also reputed as being a variety which gives good returns when grown in heavy land, a set of conditions not obtaining during the trials now commented on.

The variety B. S. F. 12 (27) gave a return of 10,568 lb. of sucrose per acre. The juices possessed a saccharine richness of 2·12 lb. per gallon. This variety forms a fairly stout yellow stem having small rounded eye-buds; its growth is erect. This variety in previous experiments gave indifferent results.

B. S. F. 12 (45) filled third place. This gave results almost on a par with those of the previously mentioned variety, producing sucrose at the rate of 10,359 lb. per acre, while it yielded at the rate of 35·4 tons of cane per acre and the juice had a saccharine richness of 2·10 lb. per gallon. This variety forms a rather slender light coloured stem, the growth of which is semi-erect and the eye-bud is small and rounded.

The above is followed in the table by the well-known variety B. 147. The varieties of cane grown by the planters in this island are decidedly mixed, it is seldom that any even moderately large area is dedicated to one variety. In this mixture, the variety under discussion is well represented. In these experiments this cane gave at the rate of 32·3 tons per acre, the calculated amount of sucrose being 9,647 lb; the juice has a saccharine richness of 2·18 lb. per gallon. The habit of growth of this variety is slightly trailing, the colour of the stem is green to bright yellow, the latter being attained when it is ripe. The internodes are long, this factor of course depending greatly on the well-being of the plant.

The next place is filled by the variety Ba. 11569 which gave a calculated return of 9,464 lb. of sucrose to the acre, the saccharine richness of the juice being 2·18 lb. per gallon, while the average number of tons per acre worked out at 24·2. In the 1922 trials this variety headed the list of those grown. It may therefore be regarded with at least some degree of confidence as being one that possesses characters above the average.

From the above table we see that the preceding is followed by B. 164 with a mean calculated tonnage of 23·2 per acre, and it gave 8,809 lb. of sucrose from the same area; the saccharine richness of the juice was 2·79 lb. per gallon.

B. 163 appears in the seventh place in the above, yielding at the rate of 8,809 gallons of "sucrose" per acre, 23·2 tons of cane per acre ; the juice possessing a saccharine richness of 2·79 lb. per gallon.

The next, the eighth place, is filled by B. 12079. This cane came fourth in the trials conducted in 1922. In the series under discussion it yielded at the rate of 28·7 tons of cane per acre, or, in terms of sucrose, 8,782 lb. The juice had a saccharine richness of 2·24 lb. per gallon.

The variety, Black Savage Transparent, took ninth place, and yielded at the rate of 8,699 lb. of sucrose per acre. It gave a calculated return of 23·9 tons, with a juice of a saccharine richness of 2·80 lb. per gallon. It is possible that this variety belongs to the White Transparent group of seedlings, probably being the same as that known in other islands as Red Ribbon.

The well-known variety B. 6450 appears next. This variety possesses a fairly stout straight stem of a bright yellow colour, with fairly long internodes. It yielded at the rate of 7,804 lb. of sucrose per acre, or, in terms of tons of cane per acre, 26·1 ; the juice had a saccharine richness of 2·16 lb. per gallon.

The only other varieties which need be commented on are B. H. 10 (12) and B. 6308. The former gave 22·6 tons of cane to the acre, or, in terms of sucrose, 7,802 lb. The latter gave 12·6 tons of cane or 3,722 lb. of sucrose. The variety B. H. 10 (12) is popular among planters in some West Indian islands ; in

these it has the reputation of being a good bearer and one moderately disease resistant. It forms fairly stout canes of a brownish green colour, the eye-bud is slight by bulging and has a tendency to develop into a shoot.

During the trials now reported on B. 6308 when reaped was somewhat over-ripe and considerable damage had been done by rats to the plants growing in the plots. Had it not been for this fact its position in the experiments would have been much better than it was. This variety produces stout yellowish canes of an upright habit.

Cotton Selection.

The laboratory work relating to Sea Island cotton selections synchronised with the writing of this report. In these circumstances data connected with this cannot now be given, and they will appear in a subsequent report. At the time of writing the Marie Galante selections had not been received from Union Island, and it is proposed to do the same with data connected with these selections as with those connected with the Sea Island type.

WORK CONNECTED WITH INSECT AND FUNGUS PESTS AND THEIR CONTROL.

The Pink Bollworm (*Pectinophora gossypiella*).

During the middle of the month of December the pink bollworm of cotton was discovered in St. Vincent. That this pest would find its way to this island was forecasted in 1921 by Mr. August Busck, Entomologist, United States Department of Agriculture, in a conversation he had with the writer. Every effort was made to prevent its introduction, but all proved futile. Subsequent to the date mentioned above, the pest was found in all of the islands in which cotton is grown, and known as the St. Vincent Grenadines. In all, with two exceptions the infestation was very light; one exception was Bequia, which had rather a heavy infestation; this was pronounced around the Harbour. The other was Union Island; here the infestation was somewhat heavy in one place only, and that was at the Experiment Station.

As soon as the pest was discovered an examination of the fields and cotton store rooms on estates indicated that the degree of intensity of attack varied very considerably. On most of the estates great difficulty was experienced in locating the insect. On one estate situated some sixteen miles from Kingstown, the severest attack of all was found. On this only a limited area of cotton was grown. Everything seems to point out that the first invasion took place at this point.

The advent of this pest in the Southern Grenadines, as far as the evidence obtained indicates, occurred at a later period. The Bequia invasion was probably a little earlier. Before the end of the season, pink bollworm could, speaking generally, be found in all the cotton fields in St. Vincent. Laws and Regulations dealing with the control of this were subsequently promulgated.

The control of the pink bollworm in the Southern Grenadines will be no easy matter. In the first instance most of these islands grow two types of cotton, Sea Island and Marie Galante. This would have no bearing on the question of control if the harvesting of them synchronised; unfortunately it does not. The reaping of Sea Island cotton may begin about August (this depends of course on date of the Close Season) and by the time this is about over, Marie Galante cotton is just coming into bearing. It, therefore, is self evident that in the Grenadines the pink bollworm will have food material at its disposal for a much longer period of time than it will have in an island which grows one type of cotton only. And, this is not where the viciousness ends. In previous years, quantities of Marie Galante cotton were brought to St. Vincent to be ginned, arriving in the island during the cotton Close Season, and often after the Close Season terminated. The reason for this was that there is only one saw gin in the St. Vincent Grenadines, and this is only

able of dealing with the crop in the island in which it is situated, *i.e.*, Canouan. is patent that St. Vincent will not want to allow seed cotton, probably badly ected with pink bollworm, to come into the island during a period when the num- s of this pest will possibly be at a minimum. The obvious retort to such an ument is "erect a ginnery", but ginneries do not appear at the mere waving wand. There appears one of four things to do, *i.e.*, (1) * gin the cotton at Car- ou, an island adjacent to the St. Vincent Grenadines, and one which possesses ficient gins to handle the cotton, and also one which grows the same type of ton and also has pink bollworm ; (2) fumigate seed cotton before it is shipped to Vincent ; (3) fumigate seed cotton before it is landed in St. Vincent ; or (4) store seed cotton until a ginnery is erected. Arguments for and against each of se suggestions could be adduced, but no useful purpose would be served by so ng. One point, however, must not be lost sight of, and that is the fact that ton growers in these islands are of the peasant class, and, speaking broadly, ctically their very existence depends on cotton.

At the time of writing sufficient experience with the pest in question has not n obtained to give a definite ruling on the question as to whether it would be nomically sound to grow only one type of cotton in the Grenadines. It is prob- e, however, that in the course of a few seasons, possibly only one more, it will clearly demonstrated that the advent of the pink bollworm has given birth to et of conditions which will preclude, for reasons above stated, the growing of Island and Marie Galante cotton in one and the same island. With the con- ions as obtaining in these islands, it would seem as though Marie Galante, the dier of the two types, should be concentrated on.

Experiments with Pink Bollworm.

When the pink bollworm first made its appearance in this island preparations re in hand for conducting experiments with cotton stainers(*Dysdercus delauneyi*). ese were abandoned and experiments with pink bollworm substituted. The re- lts as put forward are of a tentative nature ; sufficient time, since the appearance the pest, has not been available to check results or duplicate trials, hence the sults must not, in any sense of the word, be regarded as absolute. As soon as fficient material was obtained, fumigating experiments were conducted. The periments were laid out with a view of finding to what depth carbon bisulphide uld penetrate cotton seed meal so as to effectively deal with pink bollworm. r this experiment eggs, half grown larvæ, pupæ, and moths were used. Carbon ulphide was used at the rate of 1 lb. per 120 cubit feet of space. The follow- g is a plan of the experiment as laid out :—

Carbon bisulphide.				Surface of cotton seed meal.
A	B	C	D	2 inches deep
A	B	C	D	4 " "
A	B	C	D	6 " "
A	B	C	D	8 " "
A	B	C	D	10 " "
A	B	C	D	12 " "

A contained freshly laid eggs. One dozen in each.
B " half grown larvæ, taken from cotton bolls. Six in each.
C " pupæ. Six in each.
D " moths. "

It will be observed that all stages of the life-history of the insect were resented in the experiments. All stages were placed in glass tubes, both ends the tubes were originally open, these were loosely plugged with cotton wool. is was used with a dual purpose, firstly to prevent the insects from escaping d secondly to allow the fumes to penetrate. The tubes were placed horizon- ly in the meal, and twenty-five and a half hours elapsed before the box was ened. Each stage was kept in a control tube. The following gives the condi- n when first examined :—

* Subsequently the cotton was ginned at Carriacou after being fumigated at Union Island.

	Fumigated.	*Control.*
Eggs.	No hatching.	No hatching.
Larvæ.	All died except 2 in the tube buried 10 inches deep. These died soon afterwards.	All alive.
Pupæ.	No hatching.	One moth hatched.
Moths.	All dead.	All alive.

From the above it will be seen that somewhat better results were ob from the tubes buried twelve inches deep than from those buried ten inches The possible explanation is that there was a better circulation of the fu along the sides of the box than there was through the meal.

SE- The following gives the behaviour of the eggs and pupæ subsequent t removal of the tubes from the meal.

CONTROL. Egg hatching commenced on the third day and finished on the Three moths hatched from the six pupæ.

FUMIGATED.

Buried two inches deep.

Eggs. No hatching took place.
Pupæ. „ subsequently became black.

Buried four inches deep.

Eggs. No hatching took place. „
Pupæ. „

Buried six inches deep.

Eggs. No hatching took place.
Pupæ. „

Buried eight inches deep.

Eggs. No hatching took place.
Pupæ. One moth hatched on the sixth day.

Buried ten inches deep.

Eggs. Four worms appeared on the sixth day.
Pupæ. Two moths hatched on fifth day.

Buried twelve inches deep.

Eggs. Four worms appeared on the fifth day.
Pupæ. No hatching took place.

From the evidence adduced it would appear that, under the conditions above, fumigation with carbon bisulphide is effective for moth control when b twelve inches deep, eight inches for larvae and six inches for pupæ and It will be observed that no hatching of eggs took place from the tubes b eight inches, but it would be as well to put the safety limit at six inches.

Fumigation will probably be completely effective if a second fumig were given after an interval of from seven to ten days, as during this interv eggs and the pupæ not killed by the first fumigation will have hatched.

From this it would seem that such material infested with pink bollwo effectively cleared if fumigation takes place in bags with a diameter of t inches, as this brings the centre of the bag within effective range for all s These experiments only deal with the pink bollworm in cotton seed meal. possible that carbon bisulphide would have a greater effective range had experiments been tried with cotton seed for as the latter does not lie so the fumes of the fumigant probably would more easily have penetrated the

It should be pointed out that nothing in these trials indicates that pink worm can breed or maintain itself in cotton seed meal. When these experi were inaugurated it was assumed that it could; now, however, it seems possibl it cannot, but again a definite ruling on this point cannot be given. It is that further experiments with this pest will be conducted, and the reason tha ther data are not available for publication is that a batch of worms, kept hurricane lamp chimney covered with muslin, gnawed holes in the cloth and esc

Cotton Worm (*Alabama argillacea*).

Towards the latter end of the year the cotton growing in the southern part the island was severely attacked by the cotton caterpillar. There were three arate and contiguous attacks. In all approximately some 500 acres were affect-

It is seldom that such a serious attack is experienced in St. Vincent. This t has many parasitic enemies, but they did not apparently on this occasion have great controlling power. The St. Vincent planter has not had the same ount of experience as his confrère in some of the Northern Islands in controll- this pest. Another factor, and one of importance, is the local labourers' in- se dislike of applying Paris Green, and in addition they possess the unhappy ack of getting about three times as much of the insecticide on their faces and er exposed parts of their bodies as labourers in some other West Indian is- ds do. A mistake was made in the early stages by some planters in that the empt was made to control by means of collecting. Even this method was in ne cases crude and badly thought out. To illustrate it will be sufficient to say t in some cases labourers were given narrow necked bottles in which to place caterpillars. The Agricultural Department sold to planters and peasants a ge quantity of insecticides. This consisted of 782½ lb. of Paris Green, 456 lb. mixed insecticides and 22 lb. of Arsenate of Lead. In addition to this an cer went on to numerous estates and showed overseers and others how to ke bags in which the insecticide is held during application, organised gangs of ourers and taught how dusting should be conducted. It should be stated that soon as this pest was noticed, applications of Paris Green should have been mediately made. Usually this pest does but little damage in St. Vincent, but it been illustrated during the past year that it is capable of doing considerable nage, if not handled in the proper manner.

Red Ring of Coco-nuts (*Aphelenchus cocophilus*).

The year under report has been one of a harassing nature from an Agri- tural Officer's view point. It seemed that as soon as one pest was controlled, a new one was discovered, another appeared which required attention. And all the pests attacked crops that are, or will be, of vital importance to the welfare the Colony.

It should be stated that Red Ring is a serious pest of coco-nuts ; it is causing ch concern in Trinidad and is responsible for very considerable damage to coco- plantations in Central America. The disease is caused by nematode worms, or they are often called, nemas. These are small, being about $\frac{1}{25}$ inch in length, small to be seen by the naked eye, but material may be obtained from diseased sue, mixed in a little water, when the nemas can be seen under the low power a microscope.

The external symptoms of the disease are a browning or yellowing of the ves, commencing from the lowest whorl working upwards. The pronounced ernal symptom is the appearance of a red zone or ring in the stem. Nemas may found in all parts of affected coco-nut plants.

This disease was found on several estates in the island, but no large areas re attacked. There is no method of control but the drastic one of complete truction of the diseased plants by fire, and the best and perhaps only safe way do this is by the charcoal pit method. It is not proposed to discuss this method re, but every part of the tree should be destroyed, chips and every part the plant accounted for, and no soil should be allowed to be taken away from affected spot, not even that which may adhere to boots or tools. Affected areas ould be isolated by means of trenches ; in some places where the disease has been reading from tree to tree along the rows, this method has proved efficacious. o great stress cannot be laid on the importance of locating and promptly attend- to early cases. The critical period of the life-history of the coco-nut tree as gards infestation by this pest would appear to be in the fourth to sixth ar after planting.

Most of the growers who have large areas of land under coco-nuts know t methods of control ; the peasant, however, speaking generally does not. As great proportion of peasant coco-nut cultivation consist of isolated tree or tr in small scattered groups the danger to be apprehended is much greater for t planters than it is for the peasant. As a large proportion of the coco-nut pla growing in the Colony are now just about to commence bearing it behoves plant to keep a careful look-out for trees attacked by this nema, and to give any found most careful attention.

The Cotton Stainer (*Dysdercus delauneyi*).

The effects of the unremitting work carried out in connection with the co trol of this pest have produced most encouraging results during the past t seasons.

During the Close Season the same procedure as in the past was adopte The island was divided into sections and an Agricultural Officer was stationed each and was made responsible for the destruction of cotton stainers. Cott fields belonging to both planters and peasants were visited regularly during t period. During these visits it was found that one planter had failed to destr an area of some 100 acres of cotton. In this, there was ample food for staine which were present in large numbers, both on the plants and on seed cott scattered throughout the field. To complicate matters the plant common known as Cowitch (Mucuna sp.) was common in several of the fields. Labourc are extremely reluctant to work in a field or fields where this is growing, t reason being that the plant is armed with small hairs which cause extreme irri tion to the skin. The infested fields had to be weeded, seed cotton collected burnt, and the cotton plants pulled up and destroyed. At the same time nume ous traps of cotton seed meal were set in shady places. The work of controlli stainers in this locality was energetically carried out, gangs consisting of as ma as one hundred labourers were at times employed. At the expiration of some s weeks after the commencement of the work the land was cleaned up and t insects controlled. A charge under the Cotton Protection Ordinance was broug against the owner of the land on which the above occurred.

The operations as above put forward were under the control of the Forema Botanic Station, who undoubtedly did sound work on this occasion.

On one estate on the northern part of the island sugar-cane cultivation w again manured with cotton seed ; some six or seven acres were so treated and about one acre of this the seed was left uncovered. It is almost needless to s that this attracted stainers in large numbers. Procedure similar to that adopte for their control in 1922 was again carried out ; no useful purpose can be serve by repeating this. Looking at the whole matter from one angle, perhaps n useful purpose can be served by further discussing the subject. The outbrea was first noticed in the month of June and was regarded as controlled in Augus

During the year some seventy cases were brought against planters or peasan for not observing the Cotton Protection Ordinance, in other words for not obser ing the Close Season for cotton. Growers of cotton for some obscure reason do not appear to grasp the fact that laws are made to protect the crop grown b them. The makers of the law do not as a rule grow one single cotton plant fro which they can look for any pecuniary gain. When this fundamental fact grasped, possibly every individual grower will make a point of doing all in h power to control insect pests and not leave it for the "other fellow" to do. may again be repeated that community action is absolutely necessary if growe of cotton are to control the pests which now attack this crop. If this is not don it is questionable whether cotton growing in this island will be profitable. Th work in the past has demonstrated that stainers can be controlled, but it has als demonstrated that some growers apparently do not care one jot whether they a controlled or not, and the sooner this attitude is abandoned the better it will b for the community in general and the offenders in particular. This section ma

tingly be concluded by giving an extract from a Report made by an Agricultural fficer in January last : it is "the island has never been so free from stainers for ıy similar period during the past ten years that I happened to be in touch with e work".

Experiments for Control of Angular Leaf-spot.

The inauguration of these experiments was due to a suggestion made by the nperial Commissioner of Agriculture to the effect that a preparation known as Izal" might be a means of at least minimising the disease of cotton commonly ıown as angular leaf-spot (*Bacillus malvacearum*). It may be said that this ganism also possibly causes black arm and bacterial boll disease. In this ınnection W. Nowell on pages 268–279 of his monograph "Diseases of Crop lants in the Lesser Antilles" says the disease in itself is not usually considered be of much importance, though severe attacks, which involve the loss of a good al of effective leaf area, cannot be regarded as negligible. If the affection on e leaves can be held to be the main source of material for infection producing ack arm and bacterial boll disease, which is a natural conclusion, its presence comes a matter of serious concern. Frequently, however, there is no obvious idence of correlation in the prevalence of these affections. In the Review of pplied Mycology on page 382 of the November (1922) number, a review was ven of certain experiments conducted with the view of controlling the disease ıder consideration by means of sterilising the seed, the assumption being that e parasite was a seed borne one, and that cotton plants produced from sterilised ed would be immune until infestation took place from outside sources.

Seeds for this experiment were obtained from cotton bolls affected with cterial boll disease, and 14 lots of 100 seeds each were obtained ; each treatent was duplicated, there being therefore 6 different treatments ; and seven ots in duplicate were planted, one of which was the control. The following ves particulars as to the treatment of seed :—

Plot. A. Control. Seed untreated.
„ B. Corrosive sublimate 1–1000 soaked for 15 minutes.
„ C. Sulphuric acid stirred for 15 minutes.
„ D. „ „ „ until lint was removed, subsequently washed in corrosive sublimate 1-1000 for 10 minutes then washed in water.
„ E. Izal 1-500. Strength recommended by manufacturers.
„ F. „ 1-250. Double the strength recommended by manufacturers.
„ G. „ 1-375. Medium strength when compared with that recommended by manufacturers.

The seed was sown on August 13, and the germination was as follows :—

Plot.	Germination %.		
	Original.	Duplicate.	Mean.
A	19	20	19·5
B	25	23	24·0
C	23	21	22·0
D	18	22	21·0
E	19	23	21·0
F	33	22	27·5
G	22	23	22·5

All plants were examined on three occasions, *i.e.*, on August 27, October 1, d October 18. Infestation is to be interpreted as meaning any part of the plants, ıer than roots, being attacked by the disease in question. The disease was diagsed by means of the naked eye or by the use of a low power lens.

The following gives the percentage infestation found on August 27 :—

Plot.	Percentage of plants showing infestation.		
	Original.	Duplicate.	Mean.
A	0	6	3·0
B	0	0	·0
C	0	0	·0
D	1	0	·5
E	0	3	1·5
F	0	0	·0
G	0	0	·0

From the above it will be seen that cotton plants can be attacked by thi disease in a very young stage.

The following gives the percentage infestation found on October 1 :—

Plot.	Percentage of plants showing infestation.		
	Original.	Duplicate.	Mean.
A	50	25	37·5
B	0	0	0
C	0	0	0
D	53·8	13·7	33·75
E	26·7	11·1	18·9
F	0	0	0
G	10·5	5·0	7·75

From the above we see that the plants originating from seeds soaked i corrosive sublimate, sulphuric acid, and Izal 1-250 were immune from angul leaf-spot forty-eight days after seeds were sown.

The following gives the percentage infestation found on October 18 :—

Plot.	Percentage of plants showing infestation.		
	Original.	Duplicate.	Mean.
A	50·0	30·0	40·0
B	13·1	16·6	14·88
C	11·1	11·8	11·50
D	53·8	18·2	36·0
E	40·0	11·1	25·5
F	6·9	9·1	8·0
G	10·5	27·3	18·9

In the above it is seen that all of the plots had plants attacked by the disea under discussion, but least so in F plot, *i.e.*, that in which plants were growi raised from seeds treated with Izal 1-250 ; this is followed by the plot in whi plants raised from seeds treated with sulphuric acid were growing. The differen in the percentage infestation between these two is not great, but Izal is apparent simple and safe to use; sulphuric acid is not.

When the last observation was made it was more than probable that all of t plants were being infested from outside sources and also passing the disease fr one to another. It would be interesting, and possibly of economic value, if seve acres in an isolated position were grown from seeds treated with this preparatio In conclusion it might be stated that on the whole the infestation of angular le spot was mild.

OTHER PESTS.

Cotton.

Leaf Blister Mite (*Eriophyes gossypii*) in ordinary season does but little damage to cotton in St. Vincent, but in the past it has done moderate damage to Sea Island cotton plants growing in the Grenadines. During the end of the period under review it was decided to have a "Close Season" in the Grenadines for this type of cotton. The observing of such a season in St. Vincent has been the means of relegating this pest to one of minor importance, and it is hoped that the same will occur in the other mentioned islands.

Bush Bugs (*Nezara viridula*) were extremely common in a field of weeds in which a crop of peas previously grew. In this case they did no damage of economic importance. They were on several occasions moderately common in fields of cotton, but again little damage was done.

Black Scale (*Saissetia nigra*) and White Scale (*Hemichionaspis minor*) were moderately common on cotton towards the end of the year. Owing to the lateness of their appearance little or no material damage was done to the crop. Cotton Aphis and Red Spider (*Tetranychus telarius*) were found, the former on cotton and the latter on sweet potatoes.

There was but little of the fungus, *Sclerotium Rolfsii*, seen on plants growing in the island, and soft rot of cotton bolls, caused by Phythophthora, was not nearly as prevalent as it has been for some years.

As usual West Indian Leaf Mildew (*Ovulariopsis gossypii*) was common on cotton leaves, especially during the latter end of the season.

Sugar-cane.

The Moth Borer, (*Diatrea saccharalis*) the Weevil Borer (*Sphenophorus sericeus*) and Mealy Bug were all found on sugar-cane during the year.

The root disease of sugar-cane (*Marasmius sacchari*) was common. There is no doubt that this disease caused a fair amount of damage to the sugar-cane crop during 1923. The best method of combating this pest is by the application of good farming practice.

Rind fungus (*Melonconium sacchari*) was found in fields of over-ripe cane. Pineapple disease (*Thielaviopsis paradoxa*) was also noticed.

Cacao.

As usual thrips were moderately common on cacao trees. Phythophthora rot of pods was commonly noticed.

Sweet Potato.

This crop suffered from no serious pest during 1923, although Sacarabee or Jacobs (*Cryptorhynchus batatae*) and Red Spider (*Tetranychus telarius*) were present at times.

Coco-nuts.

The Palm Weevil (*Rhyncophorus palmarum*) was responsible for some damage to the coco-nut palms. White Fly (*Aleyrodicus cocois*) was moderately common and scale insects (*Aspidiotus destructor*) were generally present.

General.

The Black Weevil Borer (*Cosmopolites sordidius*) was found in some few instances attacking banana plants; Scale insects (*Aspidiotus hartii*) were common on yams; *Ballovia cistipennis* attacked the pods of pigeon peas. This insect is responsible for more damage than was previously thought. Rust was common on Maize and in some few instances Smut was found. Leaf Rust was common on the leaves of ground-nuts, it was specially noticeable when the plants were maturing.

PLANT AND ANIMAL LEGISLATION ENACTED DURING THE YEAR 1923.

During the year an Ordinance to provide for the protection of cotton was passed; this was known as the Cotton Protection Ordinance, 1923. By this the following Ordinances were repealed:—The Cotton Diseases Prevention Ordinance, 1911, the Cotton Stainer Ordinance, 1916, the Cotton Stainer Ordinance 1918, the Cotton Diseases Prevention Ordinance, 1911, Amendment Ordinance 1918, the Cotton Diseases Prevention Amendment Ordinance, 1919, the Cotton Diseases Prevention (Amendment) Ordinance, 1922. As this Ordinance was itself repealed early in 1924, no useful purpose would be served if comments are made.

The "Close Season" for cotton was, for the year 1922–23, from April 15 to June 1.

On September 15, a notice was gazetted prohibiting the importation of second hand jute bags from Barbados or the United States of America, and on November 23, a further notice was gazetted absolutely prohibiting the importation of such bags from all countries or places.

LAND SETTLEMENT.

The St. Vincent Land Settlement Scheme owes its existence to recommendations made by the West Indian Royal Commission; this was in the year 1897, when a very critical state of affairs existed.

The chief crops grown on these settlements are cotton, ground provisions cassava, arrowroot, pigeon peas, Indian corn, sugar-cane, plantains, bananas, and cacao. Possibly the largest area is under ground provisions. A considerable proportion of the produce grown is shipped to neighbouring islands. Much of the land on some settlements is exceedingly steep and as would be expected a fair amount of erosion takes place. In some of these there are ruins of sugar factories which clearly indicate that sugar-cane had been grown in these parts many years ago. Sugar-cane would possibly be as good a crop to grow from a soil conservation view point as any, as it binds and holds up the soil to a considerable extent.

The peasant regards the crops grown on his land or allotments from quite a different angle than, say, the planter. He does not always plant crops with the sole object of selling them, his aim is often to feed himself and family from the crops, or at least a proportion of them, as grown on his land. Therefore, one often sees what, to the uninitiated, is a pot-pourri of crops planted haphazard and without thought, but this is quite erroneous. There may be cacao and coffee which will be used in place of tea, sesamum or what is locally called benna, grown for its oil content and to be used in cakes, coco-nuts grown for the same and other objects, cassava and arrowroot grown for meal and starch, Indian corn to be used for innumerable purposes. It might be said with reference to this crop that in all the settlements hand mills, for grinding the corn into flour, are found. Spices, fruit and ground provisions are grown, all which help to make him and his family self-supporting.

EXPERIMENT STATION, UNION ISLAND.

Manurial Experiments with Marie Galante Cotton.

During 1922 manurial experiments with Marie Galante cotton were laid out at Union Island, but the results were not obtained in time to be included in the Report on the Department for that year,

The manures were applied on August 2, and the seeds were sown about a week afterwards. The area of each plot was $\frac{1}{80}$ acre in area, and all were in duplicate.

The following gives the kind of manures applied to each plot and the mean he return obtained from them. The results are put forward calculated to lb. seed cotton per acre :—

Plots.	Treatment.	Calculated yield per acre lb. seed cotton.			Increase or decrease on no manure.
		Series I.	Series II.	Mean.	
1	No manure	1,260	1,360	1,310	
2	Nitrogen, 30 lb. as sulphate of ammonia	1,240	1,040	1,140	Minus 170
3	Phosphoric acid, 30 lb. as basic slag.	860	1,040	950	„ 360
4	Potash, 30 lb. as sulphate of potash	1,560	960	1,260	„ 50
5	Phosphoric acid, as above, Potash as above	1,340	1,020	1,180	„ 130
6	Nitrogen, as above, Phosphoric acid as above, Potash, as above	1,100	1,120	1,110	„ 200
7	Cotton seed meal, 600 lb.	960	1,100	1,030	„ 280
8	Cotton seed meal, 600 lb. Phosphoric acid as above, Potash as above	1,180	800	1,030	„ 280
9	Pen manure, 10 tons	1,240	1,240	1,240	„ 70

It will be seen that in every instance the plots that received manure gave urns less than those obtained from the no manure plots. It is probable that cause for such results was that the manures were applied late, and in addition rought was experienced ; it, therefore, is possible that the manures were not in ondition available to the plants. This work is being continued.

Rainfall.

The following gives the monthly rainfall as measured at Union Island during 23 ; these readings were recorded by the District Officer, Southern Grenadines.

Month.	Rainfall.
January ...	·97
February ...	1·13
March ...	·74
April ...	·25
May ...	·06
June ...	·80
July ...	3·00
August ..	3·08
September ...	3·55
October ...	2·15
November ...	2·60
December ...	9·36
Total inches	27·69

Miscellaneous.

A plot of Sea Island cotton was grown, but the results obtained from this

were decidedly poor. It was planted in July, the first bearing was indifferent account of paucity of rain. In December a good flush of foliage was formed the bolls subsequently formed and those that were then on the plants were tacked by pink bollworm. In this connection it might be stated that when b in cotton fields are attacked by this pest the plants themselves throw out luxuri foliage, which will give a grower, if he is not conversant with the ravages of pest in question, a very wrong impression of what he may expect to obtain, in way of return, from such plants.

Plots of pigeon peas, broom corn, eschallots, onions and corn were grov It would, however, with a season such as the one experienced, be unfair to criti the behaviour of any of these crops. It may be said, however, that they h demonstrated that broom corn will grow moderately well, and that onions can grown if care and attention are devoted to them.

Seeds of pigeon peas, onions, broom corn, etc., were distributed free peasants.

PROGRESS IN CHIEF INDUSTRIES.

Cotton Industry.

The area of land under cotton for the season 1923-24 amounted to 4,3 acres. Of this 3,387 acres were planted under Sea Island and 1,128 acres un Marie Galante. If we compare these areas with those planted during the previ season it is seen that there was a decrease during the period under report of so 230 acres, *i.e.*, 175 acres of Sea Island and 55 acres of Marie Galante.

The following tables show the number of peasants and estate growers of c ton in the Colony and the area under this crop for the seasons 1922-23 1923-24.

Table 1.

1922-23.

		Sea Island. Acres	R.	P.	Marie Galante. Acres	R.	P.
862	Small Growers, St. Vincent ..	765	2	14	..		
310	„ „ Union Island ..	185	0	0	.. 675	2	14
273	„ „ Bequia ..	269	1	12			
38	„ „ Canouan ..	41	3	0	.. 57	3	0
4	„ „ Battawia ..	9	0	0			
1,487	„ „	1,270	2	26	733	1	14
32	Large Growers (44 Estates)	2,292	0	0	450	0	0
		3,562	2	26	1,183	1	14

Table 2.

1923-24.

1,209	Small Growers, St. Vincent ..	1,048	2	23			
276	„ „ Bequia ..	281	2	0			
298	„ „ Union Island .	124	2	18	572	3	36
41	„ „ Canouan ..	15	2	16	66	0	0
1	„ „ Mayreau ..	5	0	0			
1,825	Peasants	1,473	1	27	638	3	36
	Estates, St. Vincent ..	1,754	2	0			
	„ Grenadines ..	160	0	0	490	0	0
	Total ..	3,387	3	27	1,128	3	36

When the Report on the St. Vincent Agricultural Department for the year 922 was being written, data as to the exact returns were not available ; these, owever, came to hand as the publication was about to be bound, and the figures ere put forward in a note, which was inserted to face Page 1. The return ob- ined was at the rate of 161·6 lb. of lint per acre. Such a return as this has only een exceeded twice since the re-introduction of the Sea Island cotton industry nto St. Vincent, and these occasions were the seasons 1905-6, when 174 lb. of nt per acre were obtained, and 1906-7 when 175 lb. were reaped. The factors sponsible for the return obtained in 1922-23 are given in the report mentioned bove.

The average return per acre of Sea Island cotton lint for the seasons 1911-12 1921-22 works out at 90·1 lb. and it is interesting to compare this with the mount per acre obtained during 1922-23. If consideration is given to the fact nat 3,562 acres were planted during the latter mentioned season, it will be ealised that the increased yield was the means of placing considerable sums of oney in the pockets of planters.

The 1923-24 cotton season in spite of severe insect attacks has been a most uccessful one, and although figures are not available at the present time as to xact yields, they will undoubtedly be most satisfactory. Possibly something etween 130 and 140* lb. of lint per acre will be obtained. The factors respon- ble for this were the same as those responsible for the markedly increased yields btained in 1922-23, they were a good season and the presence of a minimum of otton stainers (*Dysdercus delauneyi*) until quite late in the season. It is pos- ble that a better yield would have been obtained had it not been for the advent f the pink bollworm (*Pectinophora gossypiella*). In most parts of the island his did but little damage, but cotton growing in one or two places was hit badly.

The past seasons have indicated in a most unmistakable manner that cotton ainers can be controlled to such an extent that the losses due to their presence re not serious. The control of this pest can only be maintained by means of ommunity action ; it is doubtful, even now, whether some planters have learnt his lesson. And, unfortunately, they have a pest in the pink bollworm as insi- ious as stainers and perhaps more so.

The following table gives the area planted in acres, and the weight of lint btained per acre in pounds, for the past ten years :—

TABLE III.

Crops.	Area planted, acres.	Weight of lint, lb.	Weight of lint per acre, lb.
1913-14	3,768	399,180	106
1914-15	4,226	323,236	76
1915-16	2,622	295,111	78
1916-17	2,404	160,168	66
1917-18	3,458	329,115	95
1918-19	4,588	437,273	95·4
1919-20	5,079	475,650	93
1920-21	6,453	614,508	95
1921-22	2,907	278,744	93
1922-23	3,562	575,640	161·6

It will possibly be interesting to readers if the return of lint for the seasons 905-6 to 1912-13 be given. If these are used in conjunction with the preceding ble, the reader will see at a glance the returns of Sea Island cotton that have een obtained since practically the inception of the industry. To include in his area planted, etc., would make the table too ponderous.

* The actual return was at rate of 139·7 lb. of lint per acre. 10% of this was stained.

TABLE IV.

Crop.	Yield of lint per acre.
1905-6	174
1906-7	175
1907-8	135
1908-9	124
1909-10	141
1910-11	156
1911-12	96
1912-13	98

The average return per acre for the past ten seasons is roughly 96 lb lint per acre.

Following the procedure adopted in previous years, the appended table been compiled and gives the amount of cotton exported during the past ten ye

TABLE V.

Years.	Export of lint lb.
1912-13	443,878
1913-14	373,122
1914-15	291,260
1915-16	237,387
1916-17	99,688
1917-18	427,273
1919	484,097
1920	494,871
1921	502,308
1922	338,279
1923	585,143

The value of Sea Island cotton exported during 1923 was £47,292. 17 White Sea Island was valued at 2/- per lb., stained from 9d. to 1/-.

Of Marie Galante cotton 5,084 lb. of lint were exported and 67,301 lb seed cotton. Converting seed cotton into terms of lint, it would appear 21,909 lb. of lint were exported, the value of which was £638. 2. 4; this typ cotton was valued at 1/- per lb. It might be mentioned that the amount of Island cotton exported during 1923 constitutes a record. The quantity of sta cotton exported was 35,583 lb., *i.e.*, between 5% and 6% of the whole, a decide satisfactory figure. For remarks dealing with insect pests, etc., found attack cotton during the year under report, the reader should peruse the section hea "Work connected with Insect and Fungus Pests and their control."

Cacao Industry.

The position as regards this industry is a difficult one. In the first inst it may be stated that St. Vincent, speaking broadly, cannot be regarded as island in which the cacao plant thrives. This does not mean that this crop, u normal conditions, cannot be profitably grown in certain sheltered situations sessing rich land and abundant rainfall. But many of the cacao plants have planted in situations which are wind swept and possess only a thin surface Again, the prices recently obtained for cacao have been such as to indicate more profitable crops than this could be grown; this factor resulted, to s exent, in the neglect of the existing plantations.

The poor prices that have ruled during the past year for West Indian c have hit planters in neighbouring islands much harder than the St. Vin planter. This of course is due to the fact that few, or none, of our plan depend absolutely on this crop.

The exports of cacao from St. Vincent for the past ten years are given the following table :—

Year.	Weight, lb.
1914	225,146
1915	236,843
1916	178,744
1917	133,391
1918	207,507
1919	219,545
1920	168,594
1921	139,135
1922	137,349
1923	121,374

As seen from the above, less cacao was exported during 1923 than any of the preceding nine years. According to Customs returns the cacao exported during the year under report was valued at £1,755. This works out at approximately 2¾d. per lb.

Starch Industry.

The position as regards arrowroot improved considerably during the year. There was on the whole a good demand for it and fair prices ruled; this was pronounced during the latter part of the period under review. During the latter months of the year the St. Vincent Arrowroot Growers Association co-operated with the Exhibition Committee in an effort to advertise this product at the British Empire Exhibition which will be held at Wembley in 1924. The Association gave a grant amounting to £125 for this purpose, and in addition 20 barrels of arrowroot. The propaganda will take the form of free distribution of illustrated literature at the Exhibition, and also free distribution of cartons of arrowroot which will contain recipes to be used in connection with the preparation of this commodity as a food.

The following gives the exports of arrowroot and cassava starches with their values for the past decade :—

Year.	Arrowroot lb.	Value £.	Cassava lb.	Value £.
1914	4,618,347	57,806	160,561	1,088
1915	5,290,781	44,689	111,722	508
1916	4,441,242	37,619	182,004	860
1917	4,737,548	40,296	218,390	1,420
1918	5,084,262	95,828	332,227	3,831
1919	2,244,276	42,222	430,415	4,836
1920	2,794,532	52,771	343,309	3,844
1921	2,093,358	21,216	156,888	1,666
1922	3,627,401	26,141	155,521	1,482
1923	2,177,182	31,829	366,085	3,700

From the above it will be gathered that arrowroot was valued at approximately 5·5d. per lb. and cassava starch approximately 2d. per lb.

Sugar Industry.

The exports of sugar and syrup for the past ten years are given below :—

Year.	Sugar lb.	Value £.	Syrup Gallons.	Value £.	Total value £.
1914	218,990	1,586	8,904	250	1,838
1915	505,232	3,253	10,079	503	3,756
1916	1,198,314	9,520	33,771	1,475	10,995
1917	1,264,201	11,584	81,114	3,102	14,686
1918	316,640	3,297	79,834	4,796	8,093
1919	250	3	170,482	10,722	10,725
1920	...	...	185,999	27,828	27,828
1921	322,560	3,514	117,157	9,878	13,392
1922	150,080	1,264	134,784	9,862	11,126
1923	145,944	1,863	275,932	18,711	20,574

It may be interesting if the practice adopted in previous annual reports i again put forward. This is to convert the sugar exported into terms of syru it being estimated that 300 gallons of syrup are equivalent to 1 ton of suga Equating sugar to syrup on this basis, the exports for the past ten years in term of syrup are as follows :—

Year.	Syrup, gallons.
1914	36,704
1915	77,579
1916	193,271
1917	97,914
1918	112,134
1919	170,875
1920	185,999
1921	160,357
1922	154,884
1923	277,877

The quantity of sugar exported in 1923 was approximately 65 tons, value at £1,863, or at the rate of £28 10s. per ton. The quantity of syrup exporte was 275,932 gallons, valued at £18,711 or at the rate of 1/4 per gallon.

It will be seen that the amount of syrup exported was far in excess of th exported for a considerable number of years.

PROGRESS IN MINOR INDUSTRIES.

Indian Corn (Maize).

The exports of maize, as indicated in the following table, were considerabl in excess of the average quantity exported during the previous nine years. Du ing 1923, 262,975 lb. or 4,696 bushels were sent out of the island. It might b stated that the Government Granary purchased corn on the co-operative syste during 1923, and this gave growers a much needed feeling of confidence. Th exports of maize for the past decade are given in the following table :—

Year.	Exports, bushels.
1914	766
1915	1,518
1916	1,652
1917	2,855
1918	3,037
1919	1,327
1920	2,428
1921	1,683
1922	581
1923	4,696

Corn exported during 1923 was valued at £1,326, which is nearly six tim that of the value of maize exported during 1922.

Coco-nuts.

There was a further increase in the area planted under this crop, the increa being something between 200 and 300 acres. On the whole the coco-nut crop the island looks decidedly promising. Coco-nut plants during 1923 were foun to be attacked by Red ring disease, an event which is discussed in another part this publication.

It may be stated that, on one estate, which has a large area under this cro machinery for drying copra by means of heated air has been recently erecte This is capable of drying 1,800 lbs in 12 hours ; the temperature at which it dried is between 160° and 180° F.

Following previous procedure the quantities of copra and coco-nuts annually xported since 1918, the period at which the industry was beginning to be of value o the Colony, are given. Values also are put forward:—

Year.	Quality.			Value.	
1918	Coco-nuts	5,723		22	£211
	Copra	7,104	lb.	189	
1919	Coco-nuts	7,000		47	£203
	Copra	9,319	lb.	156	
1920	Coco-nuts	16,448		144	£574
	Copra	22,644	lb.	430	
1921	Coco-nuts	13,339		82	£1,431
	Copra	89,005	lb.	1,353	
1922	Coco-nuts	770		£6 4s. 2d.	£2,440 17 0
	Copra	222,593	lb.	£2,434 13s. 10d.	
1923	Copra	356,626	lb.		£2,959

It will be observed that no coco-nuts were exported during 1923. When omparing the quantity of copra exported with that of the previous year we see hat a very considerable increase took place. This amounted to 132,680 lb.

Ground-nuts.

The quantity of ground-nuts exported amounted to 492,972 lb. or in terms f bushels, 8,803. This indicates that the exports were 467 bushels more than in he previous year. The ground-nuts exported during 1923 were valued at £5,988 r approximately 2·9d per lb.

The following gives the quantities of this commodity exported for ten years:—

Year.	Exports bushels.
1914	5,781
1915	10,386
1916	14,641
1917	14,424
1918	13,489
1919	11,329
1920	12,017
1921	5,584
1922	8,336
1923	8,803

Peas and Beans.

There was a slight decrease in the quantity of peas and beans exported when ompared with that of the previous season, the amount exported being 138,910 lb. r 2,482 bushels.

The following gives the exports of peas and beans for the past decade:—

Year.	Exports. Bushels.	Value. £
1914	2,141	707
1915	3,066	1,017
1916	6,418	2,070
1917	4,551	1,492
1918	3,361	1,666
1919	2,704	1,392
1920	1,581	952
1921	2,637	1,472
1922	2,731	1,640
1923	2,482	1,595

The peas and beans exported during 1923 were valued at 2·8d. per lb. o approximately 13/- per bushel.

Vegetables and Fruit.

The fruit and vegetable industry is one of considerable importance to S Vincent. During the year £3,353 worth of these commodities were exported Vegetables were valued at £3,216 and fruit at £137. All were shipped t neighbouring islands.

Rum Industry.

There were 17,527 proof gallons of rum manufactured in the island durin the year 1923. This was valued at £2,627 or at the rate of three shilling per gallon.

Oils.

Oil to the value of £390 was exported. The quantity was 2,251 gallon made up of 1,271 gallons of whale oil and 980 gallons of cotton seed oil. Thi shows a sharp decrease on that exported during 1922.

AGRICULTURAL INSTRUCTION, EDUCATION AND CO-OPERATION

The number of Agricultural Credit Societies in the Colony is twenty-one with a membership of 1,165. A report on these for the year 1923 is included i this publication.

As in previous years Agricultural Officers paid frequent visits to estates an to peasant holdings throughout the island. The St. Vincent Grenadines wer also visited by them.

The following leaflets were written by the Agricultural Superintendent They were also published in local newspapers :—

1. Notes on Vegetable Growing.
2. The Pink Bollworm of Cotton.
3. Notes on the Values of Artificial Manures.
4. The Cotton Caterpillar.
5. Red Ring of Coco-nut.

British Empire Exhibition.

During the year a Committee was formed to consider the number and kin of exhibits that were to be sent to the British Empire Exhibition to be held a Wembley during 1924. The Committee consisted of the following :—

His Honour J. Stanley Rae, Chief Justice, (*Chairman*)
The Hon'ble W. C. Hutchinson, I.S.O., Colonial Treasurer,
" " J. E. Sprott,
" " A. M. Fraser,
" Rev. E. A. Pitt,
W. M. Grant, Esq.,
A. DaSantos, Esq.,
T. Jackson, Esq., Agricultural Superintendent, (*Secretary*)
Assistant Secretary, V. D. Archer, Esq.

Subsequently this Committee co-opted certain members of the Arrowroo Growers Association. Much work of a preliminary nature was carried out durin the year, and in a subsequent report it is hoped that details will be put forward

Science Teaching.

This work is done by the Science Master attached to the Grammar School.

Details of Staff and Administration.

The sum of £1,614 was voted during 1923 for the upkeep of the Agricultural Department.

The following gives details of expenditure :—

	£	s.	d.
Salary, horse and travelling allowance, Agricultural Superintendent	450	0	0
Salaries, Foremen, Botanic and Experiment Stations, Cotton Inspector, Officer in Training and Clerical Assistant, and horse and travelling allowances, Agricultural Instructor and Cotton Inspector ...	549	5	3
Upkeep Botanic and Experiment Stations (labour, tools, manures, etc.)	522	10	11
Destruction of food plants of the Cotton Stainer ..	28	17	8
Salary, horse and travelling allowance, Government Vaccinating Officer	30	0	0
Other charges Government Veterinary Department ...	22	10	1
Special Cotton Investigations	14	7	0
Total	£1,617	10	11

Receipts.

The receipts for sale of plants and produce at the Botanic and Experiment Stations amounted to £117 8s. 1d. The total receipts were £203 10s. 7d.

STAFF CHANGES, etc.

On May 15, Miss L. E. Linley, Clerical Assistant, resigned. From this date until May 31, the post was filled by Mr. R. King. On June 1, Miss D. E. Wall was appointed.

Correspondence and Distribution of Information on Agricultural Matters.

During the year the number of minute papers dealt with amounted to 142 and the number of letters despatched was 682.

One hundred and ten copies of the Annual Report for 1921 and one hundred and twenty copies of the 1922 Report were distributed locally. In addition 247 of each were sent out of the island. Four hundred leaflets were distributed and fifty four miscellaneous publications were sent to planters and others.

Additions to Library.

Apart from publications obtained from West Indian Departments of Agriculture, the following were received :—

Kew Bulletin; The Tropical Agriculturist; The Cotton Gazette; The Cotton Growing Countries; Production and Trade, 1922; Annual Report, Department of Agriculture, Mauritius; Review of Applied Mycology; Journal of Agricultural Research; The Philippine Agricultural Review; Mycological Notes; Experiment Station Record; Bulletin of Imperial Institute; Journal of the Board of Agriculture, British Guiana; Review of Applied Entomology; Bulletin, Department of Agriculture, Mauritius; Extension Notes, Porto Rico Agricultural Department; Journal of Genetics; Bulletin, Department of Agriculture, Ceylon; Report, British Cotton Growing Association; Pamphlets, Agricultural Experiment Station Cornell University; Report, Agricultural Department, Nigeria; Oleaginous Products and Vegetable Oils; the Singapore Gardens Bulletin; Report on the Lands and Forests Department, Sierra Leone.

METEOROLOGICAL OBSERVATIONS.

The average rainfall at the Botanic Gardens for the past 30 years was 93·38

inches. Therefore, the rainfall experienced during 1923 was 13·88 inches belo the average.

RAINFALL FOR YEAR 1923.

Month.	Botanic Station.	Experiment Station.
January	4·05	4·78
February	5·03	3·60
March	2·75	1·83
April	3·95	2·74
May	1·32	·83
June	7·99	8·05
July	14·42	9·59
August	7·53	6.30
September	7·09	7·24
October	6·40	5·12
November	9·20	8·89
December	9·77	10·42
Total	79·50	69.39

At the Botanic Station rain was recorded on 307 days. The number of da during which rain was recorded at the Experiment Station was 278 days. At th Botanic Station the heaviest rain fell on November 7, when 2·54 inches we recorded. The heaviest fall was experienced at the Experiment Station on th same day when 2·75 inches were measured.

CHART 1.—ANNUAL RAINFALL, BOTANIC GARDENS, ST. VINCENT, 1894-1923.

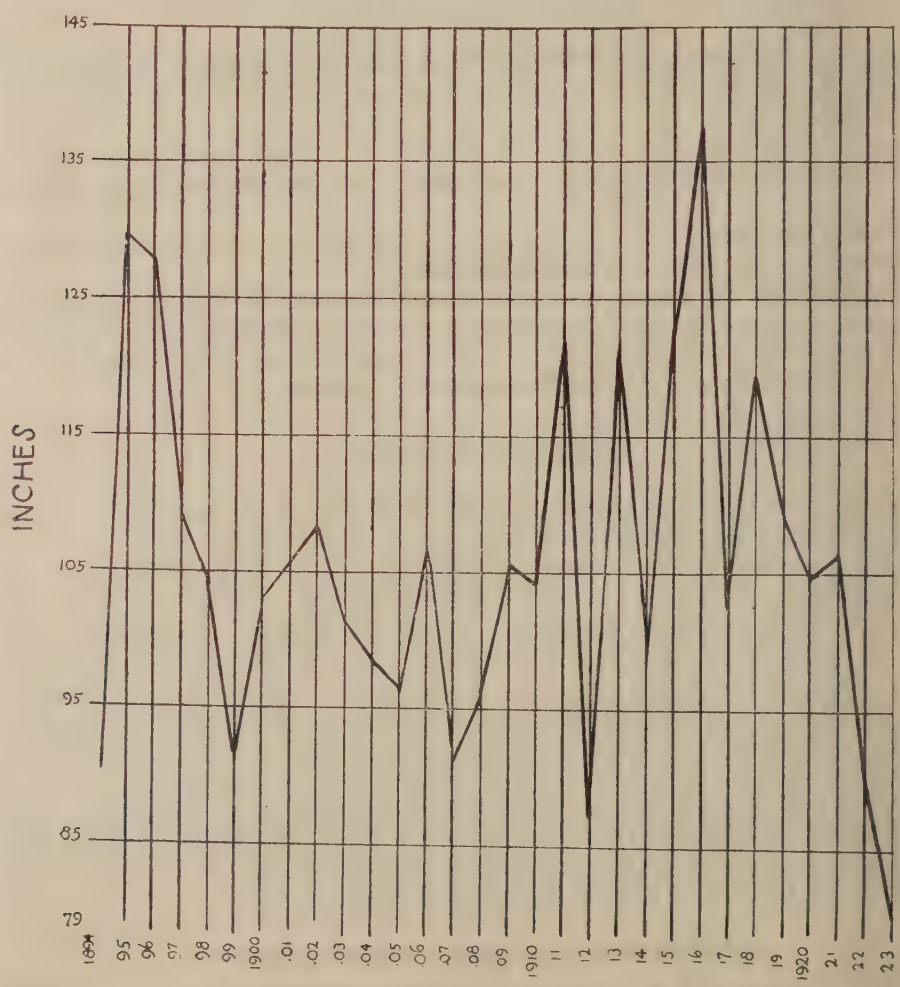
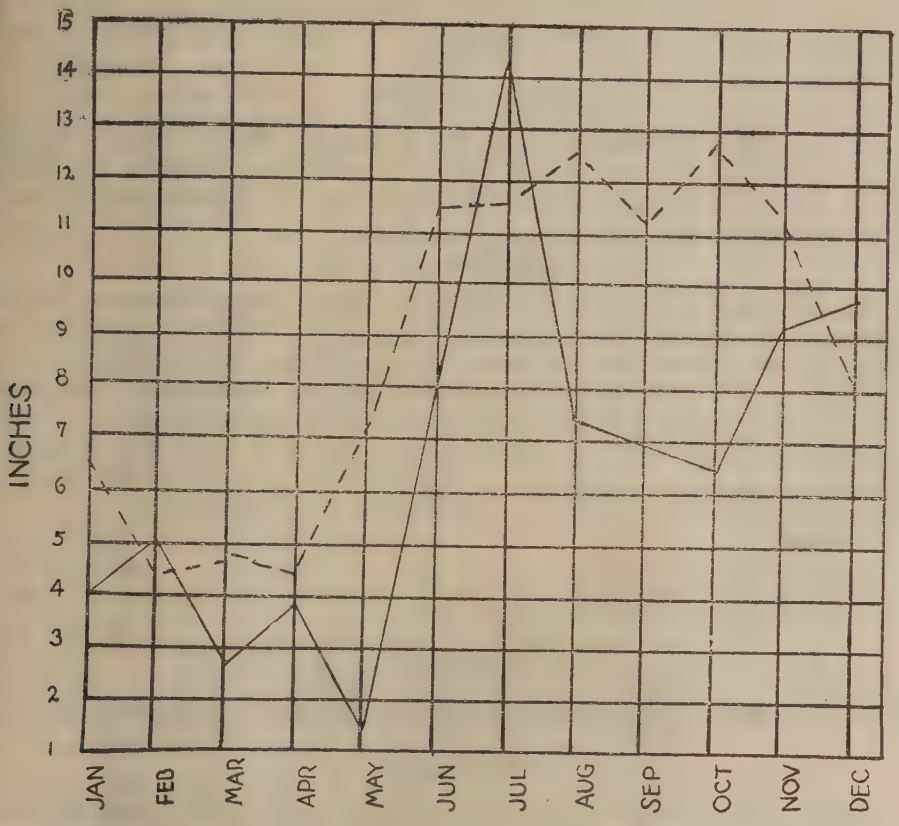


CHART 2.—MONTHLY RAINFALL, BOTANIC GARDENS, ST. VINCENT, 1894-1923.



Black line represents monthly rainfall, 1923.
Dotted line represents mean monthly rainfall, 1894-1923.

The following gives the mean temperature, average degree of humidity, and mean barometric pressure in inches for each month during the year :—

METEOROLOGICAL OBSERVATIONS, EXPERIMENT STATION, FOR 1923.

Month.	Mean Temperature, F.	Average degree of humidity. Saturation=100.	Mean barometric pressure in inches.
January ...	76·3	70·8	30·023
February ...	76·4	73·5	39·074
March ...	77·1	74·1	30·051
April ...	77·9	72·1	30·032
May ...	80·1	73·6	30·018
June ...	79·5	75·3	30·045
July ...	78·8	79·4	30·036
August ...	80·0	77·3	30·030
September ...	80·2	75·4	29·992
October ...	80·4	77·5	29·964
November ...	80·0	75·8	29·966
December ...	78·1	76·0	29·997
Mean ...	82·9	82·56	

Atmospheric Pressure.

The reading of the Barometer, corrected for instrumental error, elevation and temperature ranged from 30·166 inches on February 5 to 29·835 inches on October 23.

Official Visitors.

Professor Hardy, Professor Ballou, Mr. K. Earl and Messrs. Haig, King, Nye, Kilick and Hopkins, all attached to the Imperial College of Tropical Agriculture, and Mr. F. Stell, Mycologist, Trinidad Department of Agriculture, visited the Gardens during the year.

Veterinary Report.

It was not found necessary to fill the post of Government Veterinary Surgeon.

The microscopic examination of ears of animals for anthrax continues to be performed by the Honourable the Colonial Surgeon at the Colonial Hospital.

The vaccination of stock was performed by the Government Vaccinating Officer. This Officer also holds the appointment of Cotton Inspector.

The total sum expended on veterinary work was £52 10s. 1d., made up as follows:—

	£	s.	d.
Salary and Travelling Allowance, Government Vaccinating Officer	30	0	0
Burial of Carcasses	22	9	1
Anthrax Vaccine and Appliances		1	0
	52	10	1

Anthrax.

No cases of anthrax occurred during 1923. The last case recorded happened in 1914.

Vaccination.

Artificial immunization has been carried out during the year under review on animals intended for export only. One hundred and five animals, chiefly cattle, were so treated.

The following gives the exports of animals for which no certificates were given :—

Table A.

Class of Animal.	Number.	Value. £
Cattle ...	9	65
Horses ...	1	20
Sheep ...	813	435
Goats ...	2,773	1,094
Pigs ...	1,420	1,486
Total ...	5,016	3,100

Table B.

Showing kind, number and value of stock for which Veterinary Certificates were granted, also the Colonies to which the animals were exported.

Class of Animals.	Barbados.		Trinidad.		Grenada.		St. Lucia.		St. Kitts.		Total.	
	No.	Value. £	No.	Value £	No.	Value £	No.	Value £	No.	Value £	No.	Value £
Cattle ...	140	971	40	217	1	6	56	240	—	—	237	1,440
Horses ...	7	212	—	—	—	—	1	50	1	21	9	283
Asses ...	208	780	8	29	—	—	—	—	—	—	216	809
Mules ...	2	30	—	—	—	—	—	—	—	—	2	30
Sheep ...	20	8	—	—	—	—	—	—	—	—	20	8
Goats ...	1	1	—	—	—	—	—	—	—	—	1	1
Total ...	378	2,002	48	246	1	6	57	296	1	21	485	2,571

From the preceding it will be seen that, during 1923, 5,501 animals were exported from the Colony, and these were valued at £5,671.

Imports.

Fifteen animals valued at £154 were imported during the period under review. The following gives the details :—

Table C.

Class of Animal.	Number.	Value. £
Horses ...	3	136
Goats ...	7	16
Pigs ...	5	3
Total ...	15	155

Table D.

Showing deaths of animals in districts from natural causes.

Districts.	Cattle.	Horses.	Mules.	Asses.	Sheep.	Goats.	Pigs.	Total.
Barrouallie ...	—	—	—	—	—	—	—	—
Calliaqua ...	13	2	1	4	—	3	1	24
Chateaubelair ..	—	—	—	—	—	—	—	—
Colonarie ...	1	—	—	—	—	—	—	1
Georgetown ...	—	—	—	—	—	—	—	—
Kingstown ...	32	3	—	4	4	5	9	57
Layou ...	—	—	—	—	—	—	—	—
Mesopotamia ...	6	2	—	5	—	—	1	14
Total ...	52	7	1	13	4	8	11	96

Table E.

Showing deaths of animals in each month of the year ended December 31st, 1923.

Months.	Cattle.	Horses.	Mules.	Asses.	Sheep.	Goats.	Pigs.	Total.
January ...	1	1	—	3	—	1	1	7
February ...	5	3	—	4	—	1	—	13
March ...	1	—	—	1	3	—	—	5
April ...	9	2	—	2	—	1	—	14
May ...	2	—	—	—	1	—	1	4
June ...	7	1	—	—	—	2	—	10
July ...	3	—	—	—	—	—	—	3
August ...	2	—	1	—	—	—	1	4
September ...	4	—	—	1	—	2	1	8
October ...	10	—	—	1	—	—	2	13
November ...	4	—	—	—	—	1	4	9
December ...	4	—	—	1	—	—	1	6
Total ...	52	7	1	13	4	8	11	96

Report on the Agricultural Credit Societies for the year 1923.

The annual report on these Societies as submitted is the twelfth since their ception. It is pleasing to be in a position to report that many of the Societies ade determined efforts to pay off the money which they had borrowed. Unrtunately, others did not; among the worst offenders were Union Island, ring Village and Lowmans. In many cases the money was repaid by instalents, and it may be reiterated that this method is one which may complicate ok-keeping, but it is one which shows a desire on the part of members to raighten out matters.

There was a slight decrease in the membership of the various Societies, and ere was a decrease in the amount of money loaned. Most of the money was tained from the Colonial Bank.

Below is given a short account of the transactions of each Society with the olonial Bank and other institutions from which they borrowed money. The embership of each Society as appearing in the Registrar's Office is also given.

Georgetown. During the period under report this Society repaid all loans tained during the previous year, the total sum of which amounted to £300. f this amount £200 was obtained from the Colonial Bank, and £100 from private individual. During the year 1923 loans amounting to £390 were tained. These were obtained from the same sources, *i.e.*, £290 were borrowed om the Colonial Bank, and the remainder from a private individual. This Soety has, in the past, promptly repaid all loans obtained. It has a membership of individuals.

Union. The loan obtained from the Colonial Bank by this Society in May, 921, was paid in 1923 in instalments. A further loan of £185 was obtained om the same source in 1923. The number of members of this Society is 54.

Chateaubelair. In May, 1922, this Society obtained from the Colonial Bank loan of £150, and in May of the following year the sum unpaid amounted to 82. 10. 5. By December of 1923 the outstanding amount was £24. 16. $7\frac{1}{2}$. his was subsequently paid. The membership of this Society amounts to 30 rsons.

Troumaca. The loans obtained by this Society in the year 1922 were omptly repaid during the year under report. The loans were £115 from a rovident Society and £85 from a Temperance Society. Six per cent interest as paid in both cases. During the year 1923, £190 was obtained from the same urces, at a similar rate of interest. The membership of this Society consists 65 persons.

Lowmans. The loans obtained from the Colonial Bank by this Society in the ears 1921 and 1922 have not been repaid. These loans amounted to £325. f this amount £82. 6. $6\frac{1}{2}$ remains unpaid. Payments were made on four occaons. The membership of this Society numbers 60. It is felt that members of owmans Society have not in any way made a determined effort to meet their bligations.

Stubbs. The loan of £115 contracted by this Society in June, 1921, was not lly repaid during the year under comment, there being in December an unpaid lance of some £18. 15. $4\frac{1}{2}$. The money was repaid by instalments; there were ade some seventeen payments during 1923. The membership of this Society nounts to 92.

Spring Village. In November, 1921, this Society obtained a loan from the olonial Bank of £220, and its indebtedness to the Bank in December, 1923, was

£109. 7. 10. It, therefore, in the course of two years had only repaid a lit more than one-half of the amount originally obtained. Much better than th should have been done, and much better could have been done had a little dete mination been shown. This Society consists of 52 members.

Buccament. A loan of £125 was contracted by this Society from t Colonial Bank on July 6, 1922. All was repaid by July of the following ye A further loan of £85 was obtained during the year under report. 17 membe belong to this Society.

Clare Valley, Questelles. A loan of £250 was obtained by this Society May, 1922. This was promptly repaid. Another loan for the same amount w obtained in May, 1923. The membership of this Society is 65.

Barrouallie. Part of the loan obtained by Barrouallie Society in 19 remains unpaid. This was for the sum of £202. In December, 1923, the mon owing to the Bank was £26. 17. 11. Six payments were made during the ye These were small but they indicated a desire on the part of members to straight out matters, and this Society in the near future will probably clear itself of deb It has a membership of 47 persons.

Biabou. This Society at the end of the year had not completely repaid t loan of £207 obtained from the Colonial Bank in June, 1921. The balance d to the Bank in December was, however, only £9. 1.. 0. This was subsequent paid. No new loans were contracted in 1923. The membership of this Socie numbers 79.

Marriaqua. This Society completed a repayment of the loan of £310 obtain from the Colonial Bank in June, 1921. Repayments were made in ten instalmen No new loans were contracted during the year. This Society has a membersh of 74.

Calliaqua. This Society obtained a loan of £265 from the Colonial Bank August, 1922. This was not promptly repaid in 1923, the balance due to t Bank in December being £47. 2. 10. Repayments were made by instalmen there being nine during the year. It might be stated that the balance due w subsequently paid. The membership of this Society is 56.

Belair, Gomea. Of the loan of £305 obtained from the Colonial Bank August, 1922, the sum of £51. 15. $1\frac{1}{2}$ remained unpaid in December, 1923. T money was repaid in six instalments. It might be stated that this Society subs quently repaid all moneys owing the Bank. The membership amounts to 67.

Orange Grove. In May, 1922, this Society contracted a loan of £235 fro the Colonial Bank. This was repaid in June of the following year. Another lo of £230 was obtained in June, 1923, the payment of which in the ordirary cour of events falls due in 1924. The membership of this Society is 57.

Redemption. The outstanding balance of the loan of £285 obtained by th Society in 1921 was repaid in 1923. It was repaid in seven instalments. T membership of this Society is 56.

Union Island. The loan of £460 contracted by this Society towards t latter end of 1921 was not fully repaid. The balance remaining unpaid in Dece ber amounted to £198. 14. $10\frac{1}{2}$. Therefore, during the past two years the Socie brought its debt down from £460 to the figure previously quoted. The mon repaid during the year was paid in eleven instalments. The membership of th Society amounts to 90. The remarks as applied to Spring Village Society al apply to this.

Bequia. No portion of the loan of £131 contracted by this Society in Jun 1922, was repaid during 1923. It might, however, be stated that it was subs quently repaid. 35 persons belong to this Society.

Layou. This Society contracted no loans during the year under report, a it has no outstanding debts. It has a membership of 46.

Harmony Hall and Canouan. The remarks as applied to Layou apply also o these two Societies. The former has a membership of 43 and the latter that f 17.

TABLE 1.

STATEMENT OF TRANSACTIONS.

Name of Society.	Date of registration.	Total number of members at December 31, 1923.	Loans in 1923. £.	Total loans since registration to December 31, 1923. £.
Georgetown Agric. Credit Society ...	24. 11. 13.	63	390	2,330
Union „ „ „ ...	24. 11. 13.	54	185	1,615
Chateaubelair „ „ „ ...	24. 11. 13.	30	—	1,250
Troumaca „ „ „ ...	24. 11. 13.	65	190	2,210
Cowmans „ „ „ ...	24. 11. 13.	60	—	1,775
Stubbs „ „ „ ...	24. 11. 13.	92	—	1,950
Spring Village „ „ „ ...	20. 5. 14.	52	—	1,180
Buccament „ „ „ ...	20. 5. 14.	17	85	1,215
Clare Valley-Questelles „ ...	8. 9. 14.	65	250	2,035
Carrouallie „ „ „ ...	11. 2. 15.	47	—	1,107
Biabou „ „ „ ...	31. 1. 16.	79	—	1,489
Marriaqua „ „ „ ...	16. 3. 16.	74	—	1,420
Calliaqua „ „ „ ...	5. 8. 16.	56	—	1,800
Belair-Gomea „ „ „ ...	5. 8. 16.	67	—	2,020
Orange Grové „ „ „ ...	23. 3. 17.	57	230	1,790
Redemption „ „ „ ...	23. 5. 17.	56	—	1,175
Union Island „ „ „ ...	23. 5. 17.	90	—	2,308
Sequia „ „ „ ...	23. 5. 17.	35	—	822
Layou „ „ „ ...	18. 6. 18.	46	—	945
Harmony Hall „ „ „ ..	2. 7. 17.	43	—	395
Canouan „ „ „ ...	9. 8. 17.	17	—	80
		1,165	1,330	30,911

TABLE 2.

Comparative Statement Showing how Loans were Obtained.

Period.	From where obtained.	Amount, £.	Rate of Interest, per cent.	Total, £.
1913–14	Governor in Council	430	6	430
1914–15	Governor in Council	100	6	
	Colonial Bank	905	8	
	Provident Society	40	6	
	Private Individual	25	10	1,070
1915–16	Governor in Council	50	6	
	Colonial Bank	800	8	
	Provident Society	50	6	900
1916–17	Colonial Bank	2,555	8	
	Provident Society	150	6	2,705
1917–18	Colonial Bank	3,320	8	
	Provident Society	150	6	
	Temperance Society	80	6	
	Private Individual	100	6	3,650
1918–19	Colonial Bank	4,201	8	
	Provident Society	160	6	
	Temperance Society	80	6	4,441
1919	Colonial Bank	3,774	8	
	Private Individual	275	6	
	Provident Society	175	6	4,224
1920	Colonial Bank	4,451	7	
	Provident Society	190	6	
	Private Individual	165	6	
	Temperance Society	80	6	4,886
1921	Colonial Bank	4,614	7	
	Provident Society	215	6	
	Temperance Society	80	6	
	Private Individual	100	6	5,009
1922	Colonial Bank	1,682	7	
	Provident Society	115	6	
	Temperance Society	85	6	
	Private Individual	100	8	1,982
1923	Colonial Bank	1,040	7	
	Private Individual	100	8	
	Provident Society	100	6	
	Temperance Society	100	6	1,340

TABLE 3.

Summary.

The loans repaid during the year 1923 amounted to ...	£ 1,987	0
The total loans obtained since the Societies were registered to December 31, 1923	30,911	0
Interest on loans paid during 1923	116	7
Total interest paid from date of establishment to December 31, 1923	2,179	7

REPORT ON WORKING OF THE GOVERNMENT COTTON GINNERY FOR YEAR 1923—24.

The following section was prepared by the Manager of the Government Cotton Ginnery :—

Ginning Operations.

The quantity of Sea Island cotton ginned at the Government Ginnery during the year 1923-24 and the ginning results are given below :—

Grade of cotton.	Quantity of seed cotton ginned.	Lint obtained.	Percentage of lint to seed cotton.
White Sea Island	1,169,929 lb.	317,940 lb.	27·1
Stained „ „	154,471 „	39,344 „	25·4
	1,324,400 „	357,284 „	

No Marie Galante cotton was ginned—the entire crop obtained from the Grenadines was exported to Carriacou and Grenada.

Purchase of Cotton on the Co-operative System.

White Sea Island seed cotton was purchased by the Ginnery at 6 cents per lb. and stained at 1½ cents per lb. The quantity purchased and the ginning results were as under :—

Grade.	Seed cotton. lb.	Lint obtained. lb.	Percentage of lint to seed cotton.
White Sea Island	112,603	31,210	27·7
Stained „ „	10,727	2,912	27·1
	123,330	34,122	

Disposal of Seed.

The seed obtained from the white Sea Island cotton was disposed of as follows :—

Treated for planting purposes ..	15,174 lb.
Exported	244,881 „
Expressed at the Ginnery	577,948 „
	838,003 „

The seed obtained from the stained cotton was disintegrated and used by planters for manurial purposes.

Oil Expressing and Refining.

Oil was expressed from 768,275 lb. of cotton seed, 190,327 lb. of which were received from other ginneries. The Ginnery refined 3,247 gallons of oil from 4,760 gallons of crude oil. The low yield of 68% was mainly due to the fact

that the crude oil was mixed with oil from the previous season which had deteri-rated. 3,034 gallons of crude oil were sold to a local refinery and 3,400 gallo exported to Barbados.

Purchase of Corn on the Co-operative System.

The Ginnery purchased 29,200 lb. of shelled corn and 4,416 lb. of cob cor which was kiln-dried. 2,741 lb. of cornmeal were prepared by the use of a Kell Duplex No. 4 mill and sold locally ; 870 lb. of corn as grain were exported to S Lucia and 29,146 lb. sold in the Colony.

Other Transactions.

The following grain was fumigated and stored for private persons duri the year :—

Corn	28,198 lb.
Peas	12,678 ,,
Rice	855 ,,
	41,731 ,,

In addition to the corn purchased on the co-operative system, 7,672 lb. cob corn were shelled, 11,473 lb. of shelled corn were kiln-dried, and 10,572 lb. corn were ground into meal.

The following is a summary of the year's transactions :—

Seed cotton ginned	1,324,400 lb.
Cotton seed expressed	768,275 ,,
,, ,, disintegrated	139,216 ,,
,, ,, treated for planting purposes ...	15,174 ,,
Corn ground into meal	13,313 ,,
Cob corn shelled	12,088 ,,
Corn kiln-dried	44,206 ,,
Grain fumigated and stored	41,731 ,,
Cotton seed oil refined	3,247 galls.

(506/1924.)